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GOOD ROADS

DEVOTED TO THE CONSTRUCTION AND
MAINTENANCE OF ROADS
AND STREETS

50
VOLUME ~~XII~~
JULY—DECEMBER, 1916

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GOOD ROADS

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Number 1

The Determination of the Justifiable Cost in Highway Construction

By **EDW. ST. C. SMITH**, Assoc. M. Am. Soc. C. E.*

The selection of the best and most economical type of road to build in any particular case involves the consideration of a number of conditions affecting such a determination.

The term economical is here used in its broadest sense and is not to be interpreted as meaning cheap or low in first cost. The road of low first cost very often proves to be the most expensive in the long run because important principles were sacrificed in the original construction for reasons of so-called economy.

"The greatest enemy of good road construction is the desire to get something at a price inadequate to meet the conditions imposed. Any expenditure is justifiable which is necessary to meet such conditions and give satisfaction. It is economy in the end."

Since the conditions in different localities vary so greatly, there is no hard and fast rule to be applied in answering the question, "What kind of road shall we build?" Each case must be considered upon its own merits. Nevertheless, there are certain economic principles which can be applied to the design and construction of roads of all classes.

The following features may be said to govern the justifiable cost of any highway: (a) traffic requirements, i. e., volume, weight, and kind of traffic; (b) amount of money available for construction and maintenance.

Since any road is a failure which does not carry the traffic for which it was designed, the justifiable expenditure should be that which will produce satisfactory results under the service to which the road will be subjected.

The cost must not be regarded merely from the viewpoint of first cost but of first cost plus maintenance during the life of the road. The cost of initial construction is not the total cost of a highway. The prevailing opinion seems to be that once built a road is good for all time. No greater fallacy could be imagined. No road is ever completed in that sense, because it is at all times subject to the breaking down process of traffic wear and the deteriorating effects of the elements. Care and maintenance of a road must begin the day

A GRADED ROAD IN COLORADO—VIEW ON A CONVICT-BUILT SECTION OF THE PARKDALE-COTOPAXI CUT-OFF IN FREMONT COUNTY.

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*Former State Highway Engineer of Idaho.

A GRAVEL ROAD IN NORTH CAROLINA.

construction ends, and be religiously continued during the life of the road. Only in this way can the investment be preserved to the community. The maintenance then becomes a fixed charge which must be taken into account and provided for, and therefore constitutes a part of the ultimate cost.

Generally speaking, the answer to the question of justifiable cost is, "Pay enough to obtain a road which experience has demonstrated will meet the requirements of the present and future traffic at a reasonable cost of upkeep." If there is not sufficient money on hand to do this, put the amount available into such vital features as proper location, drainage and subgrade. These constitute the foundation upon which every good road must be supported and are the only truly permanent features. Build upon this foundation as fast as means will permit, but build the foundation first.

In selecting any type of pavement, "service tests of roads subjected to similar conditions are the best criterion for guidance." We should study those road surfaces which have given the most satisfactory results and the most adequate returns for the money expended upon them and imitate the principles employed in their construction. Tried-out forms of construction, and the materials used therein, are, therefore, the best evidences of how a road should be built in the future. The experience of the older states along this line is particularly valuable and we should profit thereby. It would be an indefensible policy to repeat the mistakes or fail to imitate the successes of other communities where road building has had its evolution from the experimental stage.

A CEMENT CONCRETE ROAD IN WASHINGTON COUNTY, OHIO—THE OHIO RIVER ROAD.

The main features to be considered in the selection of any type of road surface are:

Traffic requirements, present and future.
Availability of suitable materials.
Permanence.
Ease of maintenance.
Cost—First cost and maintenance.

Traffic.—A mistake often made is the designing of a road to take care of the traffic requirements of the present only, with no regard for those of the future. A road which is satisfactory for present day needs may be totally inadequate for the requirements a few years hence. This is particularly true of motor traffic. Also the fact that an improved road attracts increased travel must not be overlooked.

A road should be so located and constructed as to be capable of permitting future surface improvement for increased duty without sacrificing any of the original construction.

A BITUMINOUS MACADAM ROAD IN MASSACHUSETTS.

Materials.—The cost of any type of surfaced road depends largely upon the availability of the materials required in its construction. A good road cannot be built with inferior materials. Accurate knowledge of the properties of the materials used, together with information and data in regard to experimental and practical usage are essential. If all of these factors are not properly considered, results will be uncertain. Many failures and large waste of public money can be charged to the element of experimental chance and lack of accurate knowledge. Highways built with borrowed money impose a grave responsibility upon the builders whose duty should be to so build that the results of their work will not become an unjust burden upon the next generation.

Permanence.—Strictly speaking, no road surface is permanent. The so-called permanent types of roads simply approach that state more or less closely, and their degree of permanence depends upon how well they are maintained. The ideal surface is the one which requires the least maintenance. The aim should be to build this kind of road, consistent with the money available. As heretofore stated, the truly permanent features of any road are in the location, drainage and subgrade, and the success of any kind of surface depends upon careful attention to these important principles which constitute the foundation.

Ease of Maintenance.—This, while a very desirable feature of road planning, cannot govern the selection of a type because the most easily maintained pavements are usually the most expensive in first cost, representing an initial outlay and annual interest charge that is prohibitive to most communities. This fact, however, warrants the expenditure of an amount sufficient to maintain in first-class condition a surface of lower first cost.

Cost.—The most economical type of road is that for which the first cost, plus the cost of maintenance and interest on the investment for a given number of years, is a minimum. The comparatively high construction cost of one type of road might be entirely offset at the end of ten or fifteen years by the high maintenance cost of a cheaper and less permanent type of road. On the other hand, more money could be justifiably spent for maintenance on the cheaper type of road. For example, let us assume that a bituminous macadam road can be built for $10,000 per mile and suppose this to be paid for by 20-year bonds at 5 per cent. The annual charge for interest on and redemption of the bonds would be about $800. Add $100 per mile per year for maintenance and we have the sum of $900 per mile per year as the cost of the road to the community. Now, we will assume that a first-class gravel road can be built for $2,500 per mile. The annual charge for interest on and redemption of 20-year, 5 per cent. bonds would amount to about $200 per mile. Therefore, it is theoretically economical to spend $700 per mile per year for the maintenance of the gravel road if for that sum the road can be maintained in a condition giving as good service as the $10,000 road.

A BRICK PAVED ROAD IN OHIO.

"The secret of successful road construction lies in the proper design, proper construction and the use of tried-out materials." The following points should be given careful atention: Location, subgrade, drainage, and adequate foundation for surface. These may be regarded as permanent features of construction.

For surface treatment a safe rule is, "Use materials and methods of construction demonstrated by previous experience and service tests, to be satisfactory and to give an adequate return for the money."

There is one factor that more than any other is responsible for better road construction, and that is the automobile. Highway commissioners and highway engineers are often criticised for building so-called automobile roads, but such criticism is unwarranted. The automobile has come to stay and it would be folly to ignore it by building roads for team traffic only. Furthermore, the time is almost here when the automobile will be just as much a part of the utility equipment of a farm as horse-drawn vehicles. The only increase in cost of roads that can be charged directly to the automobile is the top course or surfacing. The horse-drawn vehicle is still a governing factor in the determination of grades.

A WATER BOUND MACADAM ROAD IN TEXAS.

The State of New York has been building hard-surfaced roads for many years and has had ample opportunity to observe the advantages and disadvantages of each type. Such experience and service tests extending over a period of a number of years is very valuable to any community taking up this problem. The following data are taken from a recent article by Edwin Duffey, Commissioner of Highways, State of New York.

Up until 1909 gravel and water bound macadam, and in some few instances brick roads, were the only types of pavements considered. Subsequently, roads were built as follows:

Year	Miles	Water Bound Macadam	Bituminous Macadam	Miscellaneous Types
1911..........	943	19 per cent.	75 per cent.	6 per cent.
1912..........	1,422	25 "	45 "	30 "
1913..........	95	..	..	..
1914..........	1,152	35 "	32 "	33 "
1915..........	1,066	50 "	33 "	17 "

The facts shown by the above table are very significant and are remarkable in view of the great change in traffic

A WARRENITE PAVED ROAD AT LAKE FOREST PARK, KINGS COUNTY, WASHINGTON.

A TOP-SOIL GRAVEL ROAD IN VIRGINIA.

conditions during the period covered. Note the steady increase from 19 per cent. to 50 per cent. in water bound macadam construction when it was generally supposed that this type of pavement was a failure under motor traffic.

Commissioner Duffey further states: "These percentages will probably bear out the fact that instead of the water bound macadam being superseded by bituminous penetration road, it has a distinct place of its own and to our minds is the best type of pavement for moderate traffic roads in rural localities."

It should be noted that the type of road referred to by Mr. Duffey is not a true water bound madadam but a water bound macadam with surface treatment to eliminate the dust and mud nuisance and disintegration of the top course. He says: "It has been found necessary to provide some sort of surface coat to prevent this preliminary wear and disintegration of the fine surface material. The use of calcium chloride for the first year is proving satisfactory in preventing the fine surface dust from being blown away or removed by automobiles." He states in conclusion: "Our present practice leads us to believe that water bound macadam construction, including one treatment of calcium chloride in the contract followed by bituminous surface application the following year is a satisfactory type for moderate traffic on market roads."

Width.—A discussion of this subject would not be complete without touching upon the item of widths of roads, for the reason that width affects very materially the cost of construction and maintenance.

The question of how wide a road should be built involves the consideration of several things, but is governed primarily by the amount and character of the traffic. We will consider here only the width of the pavement. Practice has demonstrated that the total width, including the ditches, should not be less than 30 ft., regardless of the width to be paved. Whether a single or double track road is to be built depends upon the traffic to be anticipated. Unless a pavement is 20 or 24 ft. wide, the traffic will cling persistently to the center of the road. The only thing that will force it from there is more traffic. There are two reasons for this: First, too much crown on a narrow road; second, the tendency to follow a rut.

A road carrying heavy traffic should be wide enough and have a crown light enough to encourage traffic to use the entire width of pavement. Only in this way can the life of the surface be increased, the maintenance cost reduced, and the road operated at its highest efficiency. It should be borne in mind that while a double track road costs proportionately more than a single track road, the maintenance cost per mile of the former is much less for the same volume of traffic.

General practice seems to have adopted a width of 9 or 10 ft. for single track roads and 15 or 16 ft. for double track roads. Intermediate widths of 12 and 14 ft. have been tried out but experience seems to have shown that unless an ample double track width is provided, a single track road had better be built, because only the liberal widths will be regarded as double track roads and the traffic will stay in the middle. The extra 3 or 4 ft. increases the cost from 33 to 40 per cent, and is not used.

The narrow, so-called double track roads would perhaps be sufficient for team traffic with some few exceptions, but for motor traffic they are invitations to disaster for automobile drivers who think they can pass at 40 or 50 miles per hour and sometimes think wrong. Accidents of this kind are of almost daily occurrence. Roads should not be designed to encourage speedy and reckless driving, but such things are inevitable and involve the lives of innocent people who must be protected. A road should either be wide enough to be safe for two vehicles or else be strictly a single track road.

A possible solution of the problem where, for financial reasons, single track roads must be built or the mileage cut down, would be to build the second or top course of macadam roads wider than the first course. In other words, extend the top course out over the earth shoulders for several feet on each side, using fine gravel or screenings. This outer strip would be used only for passing. Its duty would be very light and it would represent but a small percentage of the cost of the road.

No matter what type of road it is decided to build, the maximum possible expenditure is always limited by the availability of funds, or in other words, the ability of the community to pay for it. The justifiable expenditure within such means is then limited only by the value of the road to the community as a profit-sharing investment. And that is the way it should be regarded—as an investment—from which the annual saving in lower maintenance charges, in reduced cost of transportation, the increased value of farm lands, the increased volume of taxable valuation through further development of the country by new settlement and many other direct and indirect benefits which always result from good roads, will more than repay the annual cost of the improvement.

In most cases the communities are now paying each year as the cost of bad roads, more than would be required for

A NEW HAMPSHIRE GRAVEL ROAD—VIEW ON THE MERRIMACK VALLEY ROAD IN BEDFORD.

interest on and retirement of a bond issue which would make possible satisfactory systems of good roads.

Strictly as an investment proposition based upon decreased cost of transportation, maintenance and the saving in wear and tear on vehicles, the justifiable cost of an improved road is directly dependent upon the traffic, so that in planning a road system, the type of surface necessary for the main market roads would not be justified or necessary for the secondary roads or feeders, on account of the lighter traffic on the latter.

Whatever type of road is considered, the fact must not be overlooked that the cost of operation and maintenance is a continuing expense while the cost of construction is incurred but once, so that the type of road which costs the most to construct is not always the most expensive in the long run, nor is the one lowest in first cost always the cheapest in the end.

"The road which is truly the most economical is the one which gives the most profitable returns for the money invested in it."

How then shall a community know which is the best and most economical type of road surface suitable for its particular needs and conditions when considering improvements of this kind?

In the first place such information can be obtained only through a thorough investigation of all of the local conditions affecting the determination, such as the volume and character of traffic, both present and anticipated, the suitability of local construction materials, the limit of cost, and other matters.

These are matters to be investigated and determined by a competent highway engineer whose experience and observations are wide enough to render his report dependable and whose knowledge and familiarity with the characteristics of various types of pavements in actual service insure the reliability of his recommendations. Several states have passed laws providing that before a bond election can be called, such information must be obtained by a competent highway engineer and submitted to the proper authorities and if the bonds are voted the proceeds thereof must be expended under competent engineering supervision.

As a mater of good business procedure it is assumed that no local board or commission would make a tax levy or call a bond election for road improvement without first having the above facts and figures before them for public information.

As a corporation plans and builds a railroad, so should the representatives of a community plan and build a public work.

It is a business proposition demanding good business management.

Asphaltic Street and Road Construction in 1916

As an indication of conditions in one division of the street and road building industry, the Barber Asphalt Paving Co. reports that up to June 24 awards of contracts for sheet asphalt and asphaltic concrete city paving considerably exceeded awards for the similar period of last year. Awards for this company's materials in May were about 2,000 tons larger than in May of 1915.

In road building, while the conditions are more favorable than last year in some respects—i. e., as to the amount of work contemplated and brought out—the movement of road asphalt has been retarded by continual wet weather and lack of labor. The latter factor has also operated to delay street construction.

It will be understood that the above refers only to awards contemplating the use of natural asphalts marketed by the Barber Asphalt Paving Co.

Contracts Awarded for Cement Concrete Pavements

The yardages of cement concrete road, street and alley pavements awarded in each state during the period from January 1 to June 1 of this year are shown in the table herewith. The table is supplied by the Portland Cement Association of Chicago, Ill.

State	Roads	Streets	Alleys	Totals
Arizona	......	......	700	700
Arkansas	276,916	29,658	....	306,574
California	93,870	249,619	....	343,489
Colorado	47,500	......	....	47,500
Connecticut	13,000	185,555	....	198,555
Delaware	68,994	......	....	68,994
Florida	93,870	125,000	....	218,870
Georgia	......	180,000	....	180,000
Idaho	......	46,297	....	46,297
Illinois	1,748,371	101,593	5,415	1,855,379
Indiana	623,215	357,937	328	981,480
Iowa	......	582,782	33,033	615,815
Kansas	178,654	44,511	....	223,165
Kentucky	......	24,000	....	24,000
Maine	56,324	......	....	56,324
Maryland (D. C.)	......	26,800	2,491	29,291
Michigan	135,711	204,958	....	340,669
Minnesota	37,549	9,000	....	46,549
Mississippi	18,222	......	....	18,222
Missouri	......	94,485	2,066	96,551
Nebraska	57,500	1,000	....	58,500
New Jersey	44,470	71,958	....	116,428
New York	1,022,806	163,103	....	1,185,909
North Carolina	......	370,866	....	370,866
Ohio	432,071	202,393	900	635,364
Oklahoma	26,000	......	....	26,000
Pennsylvania	75,093	41,624	....	116,717
South Carolina	225,000	121,300	....	346,300
South Dakota	......	78,400	....	78,400
Tennessee	......	42,787	....	42,787
Texas	169,590	300,461	....	470,051
Utah	......	251,315	....	251,315
Virginia	889	18,800	....	19,689
Washington	35,000	16,996	....	51,996
West Virginia	205,036	24,588	....	229,624
Wisconsin	380,554	168,541	....	549,095
Totals	6,066,205	4,136,327	44,933	10,247,465

NEWS NOTES

Final Figures on the Portland Cement Industry in 1915, gathered by the United States Geological Survey, are said to confirm the estimate made on January 1, that there was a slight increase in shipments and a slight decrease in production. The shipments of Portland cement in 1915 were 86,891,681 bbls., valued at $74,756,674 in bulk at the mills; the shipments in 1914 were 86,437,956 bbls., valued at $80,118,475. The finished cement made in 1915 amounted to 85,914,907 bbls., which, compared with the 88,230,170 bbls. made in 1914, shows a decrease of more than 2½ per cent. The shipments of natural cement in 1915 were 750,863 bbls., valued at $358,627, a decrease in quantity of 422 bbls. and an increase in value of $7,257 compared with 1914. The shipments of puzzolan cement in 1915 were 42,678 bbls., valued at $39,801. a decrease in quantity of 25,633 bbls., and in value of $23,557 compared with the shipments of 1914, both decreases being proportionately rather large.

Park Road Work in Indianapolis, Ind., is discussed briefly in the 1915 report of the Board of Park Commissioners of that city, which is noted elsewhere in this issue. As heavy steel-tired traffic is barred from the park driveways, it is stated, it has been necessary to develop methods of construction providing a quickly compacting surface for high-speed traffic, and this has resulted in the use of uniformly graded, screened gravel combined with a ferruginous clay. The maintenance work, according to the report, has been simplified by adding to the equipment a motor-driven oil distributor and a tandem roller. James H. Lowry, Executive Officer of the board, makes the following recommendations for roadway construction and maintenance work: "All curb lines where permanent curbs are not installed should be sodded along curbs and 12 ins. back on lawns and concrete gutter plates should be installed at all inlets. Where the roadway is new a semi-asphaltic oil of about 16 gravity and containing at least 50 per cent. asphalt should be used. Where the road has aged and become compact the roadway should be cleaned and an application of liquid asphalt used in quantities from ¼ to ½ gal. per sq. yd. On this surface should be spread a layer of torpedo gravel, the surface then should be rolled and closed to traffic for about three days."

Statistics on Paving in Cities of the United States

In the accompanying tables are presented data on pavements and paving work in considerably more than eleven hundred of the cities, towns and villages of the United States of over 3,000 inhabitants. While the tables are self-explanatory, some reference should be made here to the figures themselves and to the method of presenting them.

It may be noted in passing that this compilation of figures embraces reports from a larger number of cities than have ever been included, to our knowledge, in a similar tabulation, the total number being about twice that in the compilation of the same kind printed in "Good Roads" for July of last year.

Radical changes have been made this year both in the character of the data presented and in their arrangement. Last year the data printed included the amounts and costs of various kinds of pavements laid during the preceding year and the amounts and cost of various kinds of pavements laid and to be laid during the current year. This year the information includes the amounts of various kinds of pavements laid in the several cities up to the beginning of the current year, and the amounts and costs of pavements laid and to be laid during the current year. It is felt that the total amount of each of the several kinds of pavement existing in a given city is of considerably more value than similar figures covering the pavements laid during the past year. In the matter of arrangement it should be noted that the past work and future work are included this year in one table instead of three tables, as last year. This has been accomplished by the use of letters and combinations of letters to indicate different kinds of pavement. This arrangement not only saves space but brings together all items for each individual city.

Another departure has been made in the presentation of data on construction details. Last year this information was sought from all of the cities to which inquiries were sent while this year it has been confined to the 100 cities which lead in point of population. It is believed that the practice of these cities in the construction of any particular type of pavement is sufficiently representative. These data are presented in Tables II to X, inclusive. The same restriction to the 100 leading cities has been made in the case of the data on the prevailing costs of labor and materials, presented in Table XI.

Except in cases of obvious errors, reports made by city officials have been transferred to the tables without change, and it is possible that some discrepancies may be noted, though it is felt that none of importance will be found. With the large number of reports which have been received it has been found impossible to check all of them.

It should be noted here also that some of the reports are incomplete as they refer to only one kind of pavement. These reports were secured from manufacturers and manufacturers' organizations and have been used only for those places from which full reports were unobtainable. All reports of this kind are distinguished by marks referring to footnotes giving the sources of information. In reference to the footnotes in general, it should be noted that the apparent lack of order in the reference marks is due to the fact that the data in the reports were transferred to the tables as the reports were received and not necessarily, therefore, in the order in which they appear.

Thanks are due to the city, town and village officials who have cooperated in the collection of these statistics, and also to the manufacturers and others who have rendered assistance.

TABLE I.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS.

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916. Kind	Laid to Jan. 1, 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Kind	Laid and to be laid during 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Estimated cost, including foundation but not grading
Alabama:					
Birmingham * *	C	49,927	....	.....	....
Birmingham †	....	......	BI	11,558	....
Huntsville * *	C	41,550	....	.....	....
Decatur	BI	30,000	....	None	....
	BM	15,000			
	B	3,000			
	C	3,000			
	G	10,000			
Dothan	?	1.00 (m)	....	(12)	....
Florence	G	2,466	....	.....	....
Gadsden	BC	17,500	....	.....	....
	BM	5,550			
	G	10 (m)			
	MI	5 (m)			
Mobile	SA	125,843	....	.....	....
	BI	46,015			
	B	99,819			
	C	8,000			
	SB	26,627			
	WB	256,665			
	G	40.00 (m)			
Opelika	SA	176,091	....	.....	....
	BC	36,344			
	B	182,713			
Selma * *	C	2,360	....	.....	....
Talladega	?	3.00 (m)	G	110,000	.05 (s)
Tuscaloosa * *	C	8,372	....	.....	....
Arizona:					
Douglas	....	None	BI	40,000	85,000
California (Continued):					
Pasadena	SA	233,412	....	.....	....
	BI	80,131			
	BM	430,811			
	B	1,940			
	C	9,144			
	MI	102.94 (m)			
Petaluma * *	CT	3,247	....	.....	....
Pomona	SA	11.04 (m)	....	(24)	....
	BC	2.67 (m)			
	BM	5.05 (m)			
	CT	.28 (m)			
	MI	55.38 (m)			
Redlands	?	126.00 (m)	BM	16,000 }	17,000 (t)
			?	30,000 }	
Richmond * *	CT	80,000	....	.....	....
Richmond †	....	......	BI	7,200	....
Riverside	SA	68,960	BM	17,000	14,000
	BM	438,240	CT	36,200	40,000
	G	426,730			
San Bernardino	SA	95,700	....	.....	....
	BM	218,500			
	CT	13,500			
San Diego	SA	1,056,130	....	(Indef)	....
	BC	174,117			
	C	1.30 (m)			
	G	29.50 (m)			

Arizona (Continued):					
Globe	M	5,200	?	75,000	3.55 (st)
	MI	4,000			
Phoenix	BI	231,000	?	200,000	....
Tucson	BI	96,808	BI	19,287	41,564
	MI	7,928	BC	41,841	64,854
Arkansas:					
Argenta * *	C	281,985	....	.....	....
Conway	C	5.00 (m)	....	.....	....
Fort Smith * *	C	242,078	....	.....	....
Helena †	....	......	BI	2,975	....
Hot Springs	BM	23,715	WB	4,000	....
Little Rock * *	C	700	....	.....	....
Little Rock †	....	......	BI	60,556	....
Mena	....	6 (b)	....	None	....
Newport * *	C	13,200	....	.....	....
Pine Bluff	BC	140,000	....	(Indef)	....
	B	148,000			
	CT	9,000			
	G	30,000			
	WB	65,000			
Van Buren * *	C	3,400	....	.....	....
California:					
Alameda * *	C	6,153	....	.....	....
Alameda †	....	......	BI	6,744	....
Alhambra	?	50.00 (m)	....	.....	....
Anaheim	SA	5.00 (m)	SA	66,000	90,000
	BI	1.00 (m)			
Angels Camp	G	2.50 (m)	G	700	2.75 (s)
	MI	1.75			
Bakersfield	SA	257,170	AB	58,800	70,000
	BI	22,620			
	BM	177,600			
Berkeley	SA	140,230 (23)	SA	42,000 (23)	48,000
	BI	46,070	BI	111,900	168,000
	BC	13,700	BM	6,000	6,000
	BM	2,112,000	B	12,250	27,600
	M	844,800	C	9,100	12,300
Eureka	SA	3.00 (m)	U	50,000	100,000
	M	30.00 (m)			
Fresno †	....	......	BI	37,680	....
Haywards †	....	......	BI	2,357	....
Los Angeles	SA	248.91 (m)	SA	36.01 (m)	833,825
	BI	14.36 (m)	BI	11.28 (m)	268,969
	BM	104.78 (m)	BM	2.89 (m)	43,657
	B	9.09 (m)	B	.52 (m)	16,800
	C	9.01 (m)	C	2.76 (m)	46,093
	CT	16.90 (m)	G	8.84 (m)	65,670
	G	684.00 (m)			
	SB	2.95 (m)			
Martinez	....	None	....	None	....
Marysville	SA	6,085	....	.....	....
	BC	73,743			
	M	10,153			
Modesto	SA	30,000	SA	5,131	5,672
	MI	207,990			
Oakland	SA	37.80 (m)	....	(Indef)	....
	BC	1.50 (m)			
	BM	69.10 (m)			
	B	.13 (m)			
	M	143.00 (m)			
	SB	.15 (m)			
	WB	.41 (m)			
	MI	105.60 (m)			
Oroville	BI	35,012	....	None	....
Palo Alto	SA	64,140	CT	141,762	135,000
	BC	28,830			
	CT	47,722			
	M	134,652			
California (Continued):					
San Francisco	SA	1,949,706	SA	500,000	973,500
	B	27,247	BC	10,000	16,000
	C	866	B	10,000	35,780
	SB	2,372,309	M	10,000	7,470
	MI	4,008,594 (27)	SB	25,000	88,638
	M	87.50 (m)	MI	55,000	126,220
San Jose	BC	66,000	?	100,000	160,000 (t)
	CT	484,000			
	G	300,000			
	M	200,000			
San Luis Obispo	SA	40,000	C	20,000	20,000
	G	50,000	G	80,000	8,000
	M	60,000			
San Rafael	....	......	M	30,400	.60 (s)
Santa Ana	C	11 (m)	C	15,000	15,000
Santa Barbara * *	CT	74,554	....	.....	....
Santa Rosa	SA	2.25 (m)	....	(Indef)	....
	BC	2.12 (m)			
	BM	.13 (m)			
	CT	1.25 (m)			
	M	36.00 (m)			
Vallejo	?	15.00 (m)	C	131,000	141,600
Watsonville * *	CT	980	....	.....	....
Woodland †	....	......	BI	18,000	....
Colorado:					
Boulder	C	2,102	?	28,000	42,000 (t)
	CT	177			
	G	341,600			
	M	26,255			
	MI	23,344			
Canon City	....	None	....	None	....
Colorado City	....	None	....	None	....
Colorado Springs	SA	76,000	....	.....	....
	BM	4,500			
	G	3,000,000			
	MI	120,000			
Denver * *	C	277,000	....	.....	....
Florence	C	14.00 (m)	....	.....	....
Ft. Collins	G	3,600	C	21,000	28,000
			B	1,545	
			G	25,800	7,000
Golden	G	2.00 (m)	....	.....	....
Grand Junction * *	C	10,000	....	.....	....
Greeley * *	C	1,902	....	.....	....
Longmont * *	C	11,500	....	.....	....
Loveland * *	C	11,950	....	.....	....
Pueblo	SA	140,000	?	149,000	133,000 (t)
	BI	37,000			
	G	200,000			
Rocky Ford	G	25 (b)	....	None	....
Trinidad	SA	.60 (m)	....	None	....
	BM	.95 (m)			
	B	2.14 (m)			
	C	.23 (m)			
Connecticut:					
Ansonia	CT	3,000	BM	5,000	....
	SB	1,360			
Bethel	M	1.00 (m)	...	.....	....
Bridgeport	SA	.34 (m)	?	300,000	500,000
	BC	14.96 (m)			
	B	4.40 (m)			
	C	.10 (m)			
	M	66.00 (m)			
	SB	2.57 (m)			
	WB	7.77 (m)			
Bristol	B	500	C	1,400	2,800
	C	12,000	SB	4,000	16,000
	CT	12,000			
Danbury	BM	22,500	BM	8,250	7,750
			C	6,700	7,400
			CT	1,400	2,900 (g)
Danielson	AM	? (6)	....	None	....
Darien	C	4,500 (6)	C	48,000	60,200
	C	10,000	M	2,000	1,200
	G	10,000			
	M	10,000			
	WA	40,000 (6)			
Enfield	BM	1.00 (m)	....	None	....
	G	25.00 (m)			
	M	15.00 (m)			

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TABLE I.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Connecticut (Continued):					
Essex	G	5.00 (m)	....	None	....
	M	15.00 (m)			
Greenwich	C	6.47 (m)	C	43,500	90,000 (t)
	CT	7.46 (m)			
Hartford	SA	305,837	SA	51,735	71,115 (c)
	AB	719	C	15,300	17,585 (c)
	C	1,000	M	86,000	60,500 (c)
	CT	10,722			
	M	1,500,000			
	SB	22,567			
Manchester	G	6,000	C	8,880	....
	M	8,000			
Meriden	B	33,870	C	15,200	....
	C	35,166	WB	10,700	....
	WB	76,565	M	?	....
	M	15.00 (m)			
Middletown	BI	34,600	CT }	17,500	22,500
	C	13,180	M }		
	M	12.50 (m)			
Mystic *	B	None	B	None	....
New Britain *	B	9,665	B	None	....
New Britain * *	C	23,480	....	.....	....
New Haven (18)	SA	235,646	SA	15,000	8,700
	BI	40,880	B	700	2,000
	BM	342,872	WB	54,000	154,000
	B	134,361			
	C	53,958			
	M	514,242			
	SB	39,951			
	WB	215,530			
	MI	7,598			
New London *	B	31,957	B	None	....
New London * *	C	850	....	.....	....
Norwalk	BM	4,000	C	13,000	16,000
	B	44,281			
	C	13,000			
	CT	32,724			
	SB	4,100			
	WB	42,000			
	G	50.00 (m)			
	M	20.00 (m)			
Plymouth	(2)	......	....	None	....
Putnam	BM	6,000	BM	6,000	....
	M	2,500	M	?	?
	AM	2,000			
Shelton	SB	.50 (m)	....	.....	....
Simsbury	BC	15,480	....	.....	....
	M	197,120			
	G	15.00 (m)			
Southington	BM	3,000	....	None	....
	M	37,200			
	MI	10,000			
Stafford Springs	?	2.00 (m)	....	None	....
Stamford	SA	25,050	U	.....	50,000
	B	61,543			
	SB	30,000			
	WB	22,410			
	HA	28,339			
Stratford *	B	None	B	.....	....
Wallingford	....	......	BM	8,000	....
			C	8,000	....
Waterbury * *	C	6,222	....	.....	....
Watertown	G	1.00 (m)	....	"Very little"	....
	M	5.00 (m)			
West Hartford * *	C	32,882	....	.....	....
Wethersfield	....	......	....	None	....
Willimantic	SB	9,500	SB	1,800	5,000
Winsted	BM	6,261	U	8,783 (8)	3,600 (9)
	M	2.67 (m)			
Delaware:					
Milford * *	C	6,967	....	.....	....
Wilmington †	....	......	BI	6,860	....
Illinois:					
Aledo	BC	5.00 (m)	....	None	....
Anna *	B	35,650	....	.....	....
Batavia	C	405	?	405	500 (t)
Belleville	BM	11,000	C	124,000	200,000
	B	500,000			
	C	100,000			
	WB	5,000			
Berwyn	BM	7,000	BC	236,000	417,300
	B	11,500	M	2.00 (m)	40,000
	M	15.00 (m)			
Bloomington * *	C	1,423	....	.....	....
Cairo	B	13.00 (m)	B	1,500	3,000
	G	7.00 (m)	G	50,000	35,000
Canton * *	C	5,336	....	.....	....
Centralia	B	176,000	....	.....	....
Champaign	SA	.62 (m)	?	50,000	150,000
	B	29.00 (m)			
	C	1.00 (m)			
Charleston	....	None	....	.....	....
Chicago	SA	762.10 (m)	B*	500,000	1,150,000
	BC	63.36 (m)			
	BM	101.62 (m)			
	B	288.24 (m)			
	C	59.00 (m)			
	M	529.67 (m)			
	SB	112.75 (m)			
	WB	249.12 (m)			
	MI	10.89 (m)			
Chicago Heights	B	90,000	BC	47,000	1.96 (s)
			B	90,000	2.22 (s)
Cicero	....	......	BC	52,521	1.65 (s)
			B	12,742	2.40 (s)
			M	5,560	1.25 (s)
Danville	BI	1.50 (m)	B	65,000	110,500
	BM	2.00 (m)			
Decatur *	B	1,027,600	B	82,000	144,320
Decatur * *	C	5,334	....	.....	....
De Kalb * *	C	31,481	....	.....	....
Dixon * *	C	660	....	.....	....
Du Quoin	B	77,722	C	45,875	77,869
East St. Louis	C	53.10 (m)	....	.....	....
	M	.66 (m)			
	SB	2.41 (m)			
	WB	.91 (m)			
Effingham * *	C	60,000	....	.....	....
Elgin	SA	28,924	BC	70,696	139,900
	BC	74,760	B	75,866	168,600
	BM	42,852	WB	626	3,000
	B	239,471			
	C	1,070			
	M	22,221			
El Paso *	B	26,300	B	None	....
Evanston	SA	38,538	BM	23,800	48,350 (g)
	BC	37,016	B	91,450	256,660 (t)
	BM	79,033	C	3,500	8,583 (t)
	B	250,290			
	C	14,210			
	M	794,395			
Fairbury	?	1,600 (f)	....	None	....
Freeport	B	464,460	B	20,000	49,000
	C	2,000	M	20,000	20,000
	M	316,800			
	WB	1,000			
Fulton * *	C	12,500	....	.....	....
Galena	B	6.50 (m)	B	1.00 (m)	7,000 (t)
	M	1.75 (m)			
Galesburg *	....	......	B	40,000	58,000
Geneseo *	B	25,000	B	None	....
Geneseo * *	C	6,300	....	.....	....

District of Columbia:					
Washington (5)	SA	2,920,968	AB	10,000	110,700
	AB	594,626	SA	60,000	
	BC	78,708	CT	20,000	115,700
	B	25,535	G	8,000	
	CT	51,997	M	35,000	
	M	1,980,000			
Florida:					
Jacksonville	AB	1.34 (m)	BC	8,501 (7)	23,027
	BI	.07 (m)	B	30,278 (7)	89,918
	BC	3.63 (m)			
	B	46.11 (m)			
	C	.25 (m)			
	CT	1.80 (m)			
	G	1.28 (m)			
	M	2.80 (m)			
	WB	.08 (m)			
	MI	11.53 (m)			
Lake City	B	25,000	B	21,000	27,000
	M	10,000			
Orlando	B	21.00 (m)	B	5.00 (m)	....
	G	2.00 (m)	G	5.00 (m)	....
	MI	10.00 (m)			
Pensacola	?	26.00 (m)	....	None	....
St. Petersburg	CT	2,640	B	117,333	....
	G	26,400			
	B	10.00 (m)			
Sanford	B	205,000	B	10,000	16,000
Tampa * *	C	400	....	.....	....
Georgia:					
Americus	WB	37,000	....	None	....
Athens	B	43,440	C	10,000	12,000
	C	58,638			
	M	60,686			
	SB	66,705			
	WB	1,420			
Atlanta * *	C	35,030	....	.....	....
Atlanta †	....	......	BI	11,000	....
Augusta * *	C	1,120	....	.....	....
Brunswick	B	25,000	....	None	....
	MI	80,000			
Commerce	....	None	....	.....	....
Dublin	....	None	....	None	....
Griffin * *	C	1,200	....	.....	....
La Grange	B	20,000	....	None	....
	SB	6,000			
Macon * *	C	122,938	....	.....	....
Quitman * *	C	1,230	....	.....	....
Rome * *	C	2,232	....	.....	....
Savannah	SA	141,000	AB	13,000	1.60 (s)
	AB	315,500	C	21,000	1.40 (s)
	B	393,100			
	G	50,000			
	SB	138,100			
Waycross	AB	6,000	B	7,500	11,500 (t)
	B	50,000	G	14,000	8,000 (t)
	G	10,000	SC	6,400	1,600 (t)
	SC	95,000			
Idaho:					
Blackfoot †	....	......	BI	47,700	....
Boise	SA	164,297	U	37,174	92,450
	BI	30,452			
	B	4,932			
	C	67,127			
Coeur d'Alene	BI	1.50 (m)	....	None	....
	C	1.00 (m)			
Lewiston	BI	85,000	C	6,000	....
	C	22,000			
Moscow * *	C	74,061	....	.....	....
Pocatello	CT	5,400	G	100,000	....
	G	110,000			
Weiser	BI	27,000	....	None	....
Illinois (Continued):					
Granite City	BC	1.00 (m)	WB	11,500	41,000
	B	8.00 (m)			
	WB	4.00 (m)			
Greenville *	B	31,506	B	None	....
Greenville * *	C	16,151	....	.....	....
Harrisburg	B	100,000	B	48,215	1.88½ (sg)
Harvard * *	C	8,000	....	.....	....
Herrin	B	34,354	....	None	....
Highland Park * *	CT	2,260	....	.....	....
	C	19,900			
Hoopeston	B	15.00 (m)	B	.50 (m)	....
Jacksonville	....	......	SA	15,506	38,078
			B	?	?
			CT	?	58,560
Joliet	SA	400,000	SA	50,000	1.50 (s)
	BM	10,000	BM	15,000	1.35 (s)
	B	200,000	B	15,000	1.90 (s)
	M	200,000			
	WB	8,000			
Kankakee	BC	40,200	....	.....	....
	B	30,000			
	C	3,424			
Kewanee	SA	27,000	....	None	....
	BC	44,000			
	B	75,000			
	C	850			
La Grange	BC	24,000	BC	32,000	48,000
	B	50,000	BM	6,000	8,400
			M	30,000	15,000
Lawrenceville * *	C	401	....	.....	....
Lewistown	B	2.00 (m)	B	11,248	26,500
Lincoln *	....	......	B	None	....
Lincoln * *	C	3,777	....	.....	....
Madison	B	17,000	....	None	....
	WB	33,000			
Marion * *	C	3,098	....	.....	....
Marseilles *	B	18,000	B	None	....
Mattoon *	B	......	B	31,240	52,367
Mattoon * *	C	18,330	....	.....	....
Moline	SA	207,582	SA	35,200	141,829 (t)
	BC	7,404	B	14,250	
	B	401,616			
	C	18,133			
Morris	B	33,569	U	15,000	....
	CT	45,100			
Mt. Carmel * *	C	8,200	....	.....	....
Mt. Vernon *	B	None	....	.....	....
Murphysboro	BM	50,000	B	5,000	9,000
	B	123,000	M	3,000	3,200
	M	10,000			
Naperville *	B	31,000	B	None	....
Naperville * *	C	5,500	....	.....	....
Normal	B	149,229	B	10,000	1.90 (s)
Oak Park	SA	150,000	SA	2,547	7,085
	BC	307,000	BC	208,000	572,475
	B	250,000	B	1,110	3,672
	C	912	C	3,916	7,796
	M	540,000			
	WB	9,700			
Pana	B	125,000	....	None	....
Peoria	SA	277,119	B	75,000	118,000
	B	1,163,658	C	5,000	7,000
	C	5,725			
	M	9,543			
	WB	31,372			
Pontiac	BM	7,300	B	7,309	17,500
	B	178,000			
Princeton	B	37,452	B	31,779	91,000 (t)
	C	.50 (m)			
	G	4.00 (m)			
	M	1.50 (m)			
Quincy * *	C	1,524	....	.....	....
	CT	18,800			
Robinson * *	C	7,176	....	.....	....
Rock Falls	B	53,000	....	None	....
Rockford	SA	1.83 (m)	B	60,000	150,000 (g)
	B	12.17 (m)	M	73,500	94,000 (g)
	C	.63 (m)			
	M	75.16 (m)			

Symbols for Different Kinds of Paving.—SA, sheet asphalt; AB, asphalt block; BI, bitulithic; BC, bituminous concrete; BM, bituminous macadam; B, brick; C, cement concrete without bituminous topping; CT, cement concrete with bituminous topping; G, gravel; M, water bound macadam; WB, wood block; SB, stone block; AM, Amiesite; WA, Warrenite; HA, Hassam; SC, sand-clay; RM, rocmac; U, kind not definitely decided upon; MI, miscellaneous—not included in foregoing classification.

TABLE I.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916. Kind	Laid to Jan. 1, 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Kind	Laid and to be laid during 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Estimated cost, including foundation but not grading
Illinois (Continued):					
Sandwich	....	None	B	(Indef.)	....
Savanna *	B	40,793	B	1,200-1,400	1.85 (s)
Springfield *	B	1,090,467	B	52,800	92,400 (g)
Springfield * *	C	9,815	....	.....	....
	CT	8,600			
Spring Valley	B	65,375	G	1.00 (m)	....
	G	4.00 (m)			
Staunton	B	1.50 (m)	....	None	....
	MI	25.50 (m)			
Sterling *	B	1,300	B	42,661	79,248
Streator *	B	None	B	15,016	16,100
Taylorville	?	10.80 (m)	....	None	....
Toluca	....	None	....	None	....
Waukegan	?	15.00 (m)	BM	1,900	3,600
			B	10,350	28,000
			C	21,200	39,600
Woodstock	B	14,850	....	None	....
	CT	58,200			
Indiana:					
Alexandria	B	9.00 (m)	....	None	....
	G	20.00 (m)			
Anderson * *	C	112,084	....	.....	....
Angola	AB	8,000	BC	14,000	....
	B	38,000	B	3,000	....
			C	2,600	....
Auburn	SA	48,400	....	"Indefinite"	....
	B	1,200			
	M	6,340			
Bedford	?	4.50 (m)	....	None	....
Bloomington	SA	7,900	BC	4,825	7,720
	BC	14,750	BM	3,230	1,938
	B	61,510	C	6,700	9,380
			M	2,170	1,194
			RM	1,375	1,032
			MI	25,693	....
Bluffton * *	C	4,220	....	.....	....
Clinton *	....	......	B	3,500	....
Connersville * *	C	112,944	....	.....	....
Crawfordsville	BM	5,280	B	3,000	4,200
	B	204,270			
	C	1,800			
	G	44,000			
Covington *	B	12,160	B	None	....
Crown Point *	B	......	B	14,000	....
Elkhart	SA	120,180	SA	22,900	52,000
	BC	15,880	BC	14,700	28,000
	BM	50,200	U	7,600 (20)	17,500
	B	190,525			
	C	972			
Elwood	....	......	....	None	....
Evansville * *	C	16,100	....	.....	....
Fairmount *	B	61,600	B	None	....
Fort Wayne	SA	39,003	SA	21,000	34,000
	BC	37,227	BC	40,000	64,000
	B	23,227	B	19,000	33,000
	C	3,090	C	6,600	9,900
	M	8,731	WB	8,500	17,000
Frankfort	BI	.67 (m)	U	14,000	23,900 (t)
	BM	1.50 (m)			
	B	10.47 (m)			
	C	1.45 (m)			
	CT	.14 (m)			
	G	8.17 (m)			
	M	2.54 (m)			
	MI	9.23 (m)			
Franklin *	B	76,300	B	12,710	28,000
Gary * *	C	66,017	....	.....	....
Gas City *	B	17,000	B	None	....
Greenfield *	B	53,000	B	None	....
Indiana (Continued):					
Vincennes	SA	151,983	?	100,000	275,000 (t)
	B	15,992			
	G	44.50 (m)			
Wabash	SA	134,855	SA	19,800	60,000
	BM	22,860	B	2,600	7,500
	B	19,070			
	M	210,000			
	WB	2,000			
Warsaw * *	C	1,800	....	.....	....
Winchester	B	20,000	B	4,000	7,500
Iowa:					
Ames *	B	1,261	B	.....	2,454
Ames * *	C	9,122	....	.....	....
Ames †	....	......	BI	122,043	....
Anamosa * *	C	1,000	....	......	....
Atlantic	SA	13,350	C	28,160	....
	BC	42,187			
	B	13,350			
	C	227,270			
Belle Plaine	SA	43,865	....	None	....
	B	9,711			
	C	33,000			
Boone	SA	14,220	....	None	....
	BC	118,636			
	B	126,786			
	G	528,000			
	MI	528,000			
Burlington *	C	134,599	....	.....	....
	CT	8,401			
Carroll	BC	30,000	BC	69,000	1.51 (s)
	B	20,000			
Cedar Falls *	B	98,000	B	None	....
Cedar Falls * *	C	28,100	....	.....	....
Cedar Rapids	SA	2.92 (m)	....	.....	....
	BC	4.43 (m)			
	BM	7.70 (m)			
	B	34.64 (m)			
	C	7.50 (m)			
	M	5.65 (m)			
	WB	.61 (m)			
Centerville	B	200,000	....	None	....
	C	24,000			
Chariton	B	65,000	....	None contemplated	....
	C	8,015			
Charles City	....	None	....	50,000	....
Cherokee	BC	1.50 (m)	SA	90,000	1.62 (sg)
	C	.28 (m)	C	1,325	1.35 (sg)
Clarinda * *	C	107,229	....	.....	....
Clinton	....	......	B BC	1.33 (m)	....
Council Bluffs	B	33.14 (m)	?	42,518	70,122 (t)
Cresco *	B	9,500	B	None	....
Cresco * *	C	14,067	....	.....	....
	CT	20,000			
Creston	BC	75,000	BI	45,000	90,000
	B	100,000	C	25,000	38,000
	C	15,000			
Davenport	SA	339,842	....	.....	....
	BC	39,000			
	BM	35,000			
	B	1,280,556			
	C	124,615			
	CT	11,467			
Denison	....	None	C	60,000	1.27½ (s)

Indiana (Continued):					
Hartford * *	C	6,985	....	.....	....
Huntington	B	10,110	....	May lay 7,000 sq yds.	....
	M	6,304	....		....
Indianapolis	SA	2,161,694	SA	320,000	640,000
	BC	289,645	BC	43,000	86,000
	B	1,110,349			
	C	9,429			
	M	177,949			
	WB	416,172			
	G	135.46 (m)			
Jeffersonville *	B	3.00 (m)	B	None	....
Kendallville * *	CT	12,000	....	.....	....
Kokomo * *	C	3,875	....	.....	....
Lafayette	SA	3.87 (m)	....	.....	....
	AB	.30 (m)			
	B	3.05 (m)			
	C	.34 (m)			
	G	47.43 (m)			
	M				
La Porte	BC	20,000	SA	40,000	100,000
	C	1,500			
	CT	200			
	B	(10)			
	M	(10)			
Logansport	SA	110,960	SA	65,100	158,000
	B	60.000			
Madison	....	......	U	30,000	100,706 (t)
Marion	SA	6.64 (m)	....	.....	....
	BM	12.00 (m)			
	B	30.31 (m)			
	G	8.00 (m)			
	M	12.00 (m)			
Michigan City * *	C	3,030	....	.....	....
Mt. Vernon * *	C	633	....	.....	....
Muncie	AB	1.44 (m)	U	20,000	....
	B	11.00 (m)			
	M	50.00 (m)			
	WB	1.00 (m)			
Nappanee	B	3.00 (m)	....	Probably ⅝ mile	....
	C	2.50 (m)			
New Albany	B	8,700	?	59,236	....
	M	50,536			
Noblesville	B	61,380	B	7,920	63,744 (t)
			C	45,200	
Peru * *	C	5,154	....	.....	....
Portland	B	72,600	?	10,000	25,000 (t)
Princeton *	B	40,000	B	None	....
Richmond	SA	18,749	SA	14,283	21,400
	BM	.25 (m)	BM	1,480	1,300
	B	6.90 (m)	B	2,240	3,300
	C	3.93 (m)	C	4,458	5,500
	G	26.08 (m)	M	6,000	....
	M	19.77 (m)			
	WB	.08 (m)			
Rochester * *	C	5,979	....	.....	....
Rushville * *	C	2,019	....	.....	....
Seymour * *	C	61,250	....	.....	....
South Bend	SA	215,308	SA	27,916	83,748
	BM	79,373	BC	34,050	69,550
	B	1,035,823	U	71,500	154,000
	C	17,175			
	M	35,615			
Sullivan *	B	None	B	None	....
Sullivan * *	C	2,600	....	.....	....
Terre Haute	SA	68,645	B	2,286	1.82 (s)
	BI	7,021			
	BC	2,602			
	B	196,647			
	C	34,679			
	WB	2,921			
Tipton	B	10.00 (m)	U	8,000	24,000 (26)

Symbols for Different Kinds of Paving.—SA, sheet asphalt; AB, asphalt block; BI, bitulithic; BC, bituminous concrete; BM, bituminous macadam; B, brick; C, cement concrete without bituminous topping; CT, cement concrete with bituminous topping; G, gravel; M, water bound macadam; WB, wood block; SB, stone block; AM, Amiesite; WA, Warrenite; HA, Hassam; SC, sand-clay; RM, rocmac; U, kind not definitely decided upon; MI, miscellaneous—not included in foregoing classification.

Iowa (Continued):					
Des Moines	SA	917,405	?	200,000	374,000
	BI	174,699			
	BC	29,424			
	B	1,125,043			
	C	168,969			
	G	2,966			
	M	9,933			
	SB	260			
	WB	72,682			
	MI	2,040			
Dubuque *	B	285,900	B	80,000	170,000
Dubuque * *	C	14,797	....	.....	....
Eagle Grove * *	C	55,660	....	.....	....
Forest City	B	34,000	SA	25,000	45,000
Ft. Dodge * *	C	37,488	....	.....	....
Ft. Madison	....	......	B	22,000	....
Glenwood * *	C	17,620	C	18,000	....
Grinnell *	B	None	B	None	....
Grinnell †	....	......	BI	62,223	....
Hampton	B	.87 (m)	....	.....	....
	C	2.25 (m)			
Harlan	BC	27,829	....	None	....
	C	15,000			
	B	2.5 (m)			
Indianola	SA	.33 (m)	C	50,000	75,000
	C	3.00 (m)			
	WB	.75 (m)			
Iowa City	BI	118,000	U	19,000	42,000 (t)
	B	219,000			
	C	12,000			
	WB	2,400			
Iowa Falls	B	50,000	CT	60,000	120,000
	CT	13,000			
	G	6.00 (m)			
Keokuk	BM	1,100	....	(Indef.)	25,700
	B	5,232			
	C	21,167			
Knoxville	BC	18,800	?	15,550	23,320 (t)
	B	800			
	C	22,350			
	WB	7.200			
Le Mars * *	C	68,605	....	.....	....
Manchester * *	C	3,080	....	.....	....
Marshalltown	C	35,111	C	63,000	96,000
Mason City	SA	184,313	SA	164,000	350,000 (g)
	B	58,457	C	50,000	89,000 (g)
	C	163,776			
	WB	760,000			
Muscatine	BC	3.00 (m)	?	3 (m)	....
	B	16.00 (m)			
	CT	1.00 (m)			
Newton * *	C	57,910	....	.....	....
Oelwein	BI	13,136	....	Undecided	....
	BC	75,000			
	B	25,000			
	C	7,500			
Oskaloosa	B	16,312	B	(Indef.)	2.02 (s)
Pella *	B	None	B	None	....
Perry	BI	52,000	U	32,700	60,000
	B	2,700			
	C	15,000			
	WB	33,000			
	(1)	32,000			
Red Oak *	B	9.50 (m)	B	None	....
Red Oak * *	C	10,312	....	.....	....
Sheldon	C	35,000	C	21,000	1.34 (st)
Shenandoah * *	C	1,000	....	.....	....
Sioux City	SA	265,000	SA	6,000	....
	BC	6,000	C	250,000	375,000 (t)
	B	176,000			
	C	1,000,000	....	.....	....
	WB	25.000			
Spencer	SA	70,000	SA	43,000	69,660
Valley Junction *	B	None	....	.....	....
Vinton * *	C	36,818	....	.....	....
Washington * *	C	21,613	....	.....	....
	CT	12,000			
Waterloo *	B	112,000	B	22,000	50,000

TABLE 1.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Iowa (Continued):					
Waterloo * *	C	6,500	....	.....	....
Waverly * *	C	3,000	....	.....	....
Kansas:					
Arkansas City	B	43,913	B	25,000	45,000 (g)
	C	2,000			
	MI	83,657			
	M	6.00 (m)			
Atchison		24.00 (m) (11)	B	15,000	30,000 (t)
			C	5,000	
Columbus * *	C	900	....	.....	....
Dodge City * *	C	830	....	.....	....
Emporia	BC	13.00 (m)	?	28,000	31,000
	B	6.00 (m)			
Frontenac	....	......	....	None	....
Girard * *	C	1,310	....	.....	....
Hiawatha * *	C	2,200	....	.....	....
Holton	B	50,000	B	10,000	20,000
Hutchinson	BI	80,000	B	50,000	90,000
	B	110,000			
	C	10,000			
	WB	5,000			
Independence	?	23.00 (m)	....	.....	....
Iola	MI	46,600	BC	10,000	13,000
Junction City	B	38,257	CT	15,000	30,000 (t)
	C	10,940			
	CT	104,078			
	MI	68,971			
Kansas City * *	C	232,886	....	.....	....
Kansas City †	....	......	BI	29,970	....
Lawrence	BC	26,000	B	3,000	5,500
	B	66,800	C	1,800	2,000
	C	10,000			
Leavenworth * *	C	16,770	....	.....	....
Manhattan	BC	42,750	BC	16,700	28,900 (t)
	B	1,192			
	C	3,360			
	M	1,520			
McPherson	BC	120,000	BC	41,000	50,000
	B	40,000			
	C	5,600			
Neodesha	B	166,647	B	2,409 (25)	....
Newton	SA	178,402	....	.....	....
Olathe	B	126,700	....	.....	....
Osawatomie	BM	50,000	BM	15,000	16,000
	B	300			
	C	300			
Ottawa	BM	57,747	B	9,370	22,000
	B	169,024			
	C	10,400			
	M	5,458			
	MI	17,526			
Parsons	BC	25,558	?	10,000	17,000 (t)
	B	86,935			
	M	341,477			
Pittsburgh	B	459,612	B	30,000	50,000
	C	16,779	MI	10,000	15,000
	M	15,215	MI	29,000 (17)	40,000
Rosedale	?	7.00 (m)	....	(Indef.)	....
Salina * *	C	1,025	....	.....	....
Topeka	BC	177,000	BC	65,000	87,750
	B	931,000	B	46,000	59,580
Wichita * *	C	42,712	....	.....	....
Kentucky:					
Ashland	BC	95,622	B	54,000	145,000
	B	253,000			
	C	500			
	M	10,600			
Bowling Green *	B	None	....	.....	....
Maine (Continued):					
Augusta *	B	None (m)	B	None	....
Bangor *	B	60 (25)	....	.....	....
Bangor * *	C	13,201	....	.....	....
Bath	BM	7,609	....	.....	....
	SB	6,654			
	G	15.00 (m)			
	M	5.00 (m)			
	MI	29.00 (m)			
Biddeford	M	22,000	....	(indef)	30,000 (t)
	SB	8,023			
	G	20,000			
	HA	14,170			
Brunswick *	B	None	B	None	....
Canton	....	None	....	None	....
Gardiner * *	CT	4,500	....	.....	....
Houlton	M	3.5 (m)	C	800	1,000
			M	0.5 (m)	....
Lewiston	....	......	BM	10,000	....
			SB	4,000	....
			G	4.00 (m)	....
Milo *	B	None	B	None	....
Portland	BI	42,198	BM	2,407	1,644
	BM	55,842	CT	8,500	12,750
	B	4,084	SB	4,853	10,919
	CT	92,051	MI	6,916	12,976
	M	257,122			
	SB	277,110			
	MI	28,950			
Rumford	SA	6,000	....	indef	....
	BM	1,200			
	G	30,000			
	M	40,000			
Saco *	B	None	....	.....	....
South Portland	CT	16,000	BM	11,000	6,000
	SB	2,200			
Waterville	C	4,000	BC	2,500	....
	M	4,000	G	10,000	....
	SB	4,200			
Westbrook *	B	None	B	None	....
Maryland:					
Baltimore	SA	2,102,964	U	450,000	666,700 (t)
	AB	406,651			
	BI	260,561			
	BC	277,986			
	BM	76,890			
	B	1,178,088			
	C	22,232			
	M	727,246			
	SB	931,898			
	WB	55,605			
	AM	4,600			
	MI	38,181			
Cambridge	B	20,000	....	(Indef)	....
Easton	BC	43,694	....	None	....
	BM	8,825			
	CT	6,332			
	M	2,700			
Frederick	BC	5,197	....	None	....
	BM	62,919			
	B	44,555			
Hagerstown	BM	21,343	BM	30,000	....
Pocomoke City * *	C	25,000	....	.....	....
Westminster	C	2,800	?	12,000	7,000 (t)
	BC	1.50 (m)			
	M	3.50 (m)			
Massachusetts:					
Adams	BM	5,000	B	6,000	18,000 (t)
	B	22,000			
	C	3,061			
	G	90,000			
	M	22,000			

Kentucky (Continued):					
Dayton	BM	?	BM	2,000	1.30 (s)
	B	16,000	C	500	1.50 (s)
	M	15.00 (m)			
Earlington *	B	None	B	None	....
Fort Thomas	M	15.00 (m)	BM	19,000	1.06-1.24 (s)
			C	20,000	1.46 (s)
Frankfort	M	?	B	7,000	....
Henderson	M	92,529	M	100,000	15,000
Hopkinsville * *	C	478	....	.....	....
Lexington *	B	88,000	B	None	....
Lexington * *	C	1,300	....	.....	....
Louisville	SA	71.55 (m)	SA	34,139	64,864
	BC	4.05 (m)	BC	3,460	2,422
	BI	2.38 (m)	B	45,630	86,697
	B	66.99 (m)	SB	3,380	10,140
	G	.49 (m)			
	M	60.06 (m)			
	SB	19.41 (m)			
	WB	.95 (m)			
	MI	4.76 (m)			
Ludlow	BI	6,600	....	About 1 mile, probably brick or bitulithic.	....
	B	20,000			
	C	3,000			
	G	40,000			
	M	15,000			
Maysville	B	25,000	SA	16,000	2.16 (s)
			B	30,000	2.04 (s)
Middlesboro *	B	None	B	None	....
Owensboro	BI	27,195	....	.....	....
Paducah	BI	42,074	WB	5,500	....
	B	73,416	U	27,500	....
	G	53.30 (m)			
	M	.10 (m)			
Paris		None	....	None	....
Louisiana:					
Alexandria	SA AB BI	3.97 (m)	....	.....	....
	B	3.07 (m)			
	G	2.40 (m)			
Baton Rouge	BI	4.00 (m)	....	.....	....
	B	2.00 (m)			
	G	10.00 (m)			
Houma	....	None (13)	....	.....	....
Jeanerette	BI	30,000	....	None	....
Lake Charles	B	91,058	....	.....	....
	CT	32,540			
	G	12,645			
Monroe	BM	3.5 (m)	....	None	....
	B	22,222			
Morgan City	MI	6.00 (m)	MI	6.00 (m)	....
New Orleans	SA	1,474,187	SA	24,800	52,080
	BI	319,088	BI	207,930	499,032
	B	174,416	BC	14,820	29,640
	CT	5,491	BM	221,000	205,530
	G	228,080	WB	31,830	91,352
	SB	402,970			
	WB	30,776			
	MI	1,079,759			
Shreveport	SA	9.00 (m)	BC	134,400	1.60 (sg)
	BI	11.00 (m)	B	6,000	2.00 (sg)
	BC	12.00 (m)			
	B	8.00 (m)			
	C	6.00 (m)			
	WB	2.00 (m)			
Maine:					
Auburn	BM	1.50 (m)	SB	4,555	....
	SB	2.00 (m)			
Massachusetts (Continued):					
Amesbury	BM	10,000	WA M	12,000 2.00 (m)	27,000 (t)
	C	80.00 (m)			
	M	10.00 (m)			
	MI	4.00 (m)			
Amherst *	B	None	B	None	....
Arlington	BM	6.80 (m)	....	.....	....
	G	21.92 (m)			
	M	8.70 (m)			
	SB	.10 (m)			
Athol	BM	36,209	B	3,059	8,400
	B	6,172			
	SB	12,117			
Belmont	BM	35,200	BM	8,800	7,040
	CT	3,500	CT	3,500	2,800
	G	294,000			
	M	140,800			
Beverly *	B	None	B	None	....
Billerica	M	4.00 (m)	....	.....	....
Blackstone	BM	4.00 (m	....	None	....
	G	47.00 (m)			
	M	2.00 (m)			
Boston	SA	341,478	....	(Indef)	....
	AB	81			
	BI	224,307			
	BM	1,609,001			
	B	111,804			
	C	1,618			
	CT	1,250			
	G	619,302			
	M	5,457,803			
	SB	2,331,631			
	WB	221,892			
Braintree	M	20.00 (m)	BM	1.50 (m)	15,000 (t)
Brockton	BC	26,000	BM	31,316	1.15 (s)
	C	2,440	C	2,440	....
	SB	166,614	SB	5,144	....
	BM M	430,565			
Brookline	BI	22,000	BI	5,000	....
	B	12,430	BM	5.00 (m)	....
	SB	23,176			
	WB	9,000			
	BM	16.30 (m)			
	G	10.00 (m)			
	M	12.00 (m)			
Cambridge	BI	39,327	....	.....	....
	BM	17,562			
	SB	2,047			
	WB	10,834			
Chicopee *	B	None	B	None	....
Clinton *	B	None	B	None	....
Concord	BC	6,650	BC	4,800	6,000
	G	910	BM	23,000	30,000
	M	2,733	M	9,000	9,000
Easton	G	48.00 (m)	....	None	....
	M	15.00 (m)			
Everett	BI	.05 (m)	....	(Indef)	....
	B	.12 (m)			
	C	.06 (m)			
	G	11.03 (m)			
	M	35.53 (m)			
	SB	2.95 (m)			
Fall River	SA	7,622	C	8,400	18,500
	BI	35,904	SB	5,700	21,500
	BM	88,555			
	B	1,679			
	SB	344,961			
	WB	1,888			
	HA	23,850			
	M	?			
Fitchburg	BM	7.00 (m)	AB BM CT SB RM	Some or all of these may be put down in 1916	50,000 more or less
	G	112.97 (m)			
	M	13.00 (m)			
	SB	6.95 (m)			
	WB	.65 (m)			
	MI	.40 (m)			
Franklin	G	27.00 (m)	BM	5,000	....
	M	5.00 (m)			

Symbols for Different Kinds of Paving.—SA, sheet asphalt; AB, asphalt block; BI, bitulithic; BC, bituminous concrete; BM, bituminous macadam; B, brick; C, cement concrete without bituminous topping; CT, cement concrete with bituminous topping; G, gravel; M, water bound macadam; WB, wood block; SB, stone block; AM, Amiesite; WA, Warrenite; HA, Hassam; SC, sand-clay; RM, rocmac; U, kind not definitely decided upon; MI, miscellaneous—not included in foregoing classification

TABLE 1.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on this page. For notes see end of table.)

City	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Massachusetts (Continued):					
Gardner *	B	None	B	None	....
Grafton	M	1.50 (m)	....	.....	....
	MI	5.00 (m)(6)			
Great Barrington	AB	1,000	B	4,500	....
	BI	7,333			
	B	4,462			
	G	20.00 (m)			
Greenfield	BC	6,500	....	None	....
	B	6,200			
	G	20,000			
	M	200,000			
Haverhill	BM	357,194	....	Not decided	....
	C	9,776			
	CT	30,635			
	G	54,320			
	M	180,290			
	SB	101,513			
Holliston *	B	None	B	None	....
Hudson *	B	None	B	None	....
Lawrence	SA	6,707	SB	13,000	....
	B	17,070			
	M	365,619			
	SB	391,609			
	WB	2,187			
Lenox*	B	None	B	None	....
Leominster	SA	10.00 (m)	....	None	....
	BM	30.00 (m)			
	G	50.00 (m)			
	M	8.00 (m)			
	SB	.20 (m)			
Lexington*	B	None	B	None	....
Lowell	SA	41,589	BM	60,000	60,000
	BI	20,140	G	50,000	10,000
	BM	142,675	SB	30,000	75,000
	B	1,997			
	C	11,812			
	M	599,404			
	SB	146,801			
	MI	10,270			
Lynn	BI	54,920	BM	35,000	....
	BM	24,498	C	66,000	....
	C	128,429			
	SB	95,397			
	HA	64,202			
Malden	BM	2.00 (m)	....	(Indef)	....
	B	.17 (m)			
	C	.50 (m)			
	G	43.00 (m)			
	M	20.00 (m)			
	SB	2.00 (m)			
Mansfield	BM	7,530	BM	4,932	5,000
	G	10,000	G	7,000	2,000
Medford	BI	7,449	BM	16,000	16,000
	BM	24,000			
	B	267			
	M	72,000			
	SB	2,726			
Methuen	BM	35.00 (m)	....	.....	....
Middleboro	BM	2.00 (m)	....	.....	....
	CT	2.00 (m)			
	M	1.00 (m)			
Monson*	B	None	B	None	....
Needham	BM	7,900	BM	19,000	11,000 (t)
Massachusetts (Continued):					
New Bedford	AB	273	BC	17,000	24,650
	BI	168,941	BM	147,000	111,720
	BC	12,965	M	12,000	7,200
	BM	54,228	SB	4,800	14,400
	B	12,128	WB	7,800	21,450
	M	1,269,122			
	SB	166,959			
	WB	15,197			
Newton * *	C	10,000	....	.....	....
North Adams	BC	1,870	....	.....	....
	BM	4,000			
	B	59,333			
	CT	612			
	SB	3,366			
	G	17.56 (m)			
North Andover * *	C	22,000	....	.....	....
North Attleboro	BM	94,240	BM	12,000	....
	B	15,253	G	2.00 (m)	....
	G	194,773	M	2.00 (m)	....
	M	206,507			
Norwood	....	......	BM	14,000	16,000 (g)
			G	40,000	5,000 (g)
			M	20,000	10,000 (g)
			SB	12,000	40,000 (g)
Orange	....	None	....	None	....
Palmer	BM	3.00 (m)	....	None	....
	G	5.00 (m)			
	M	2.50 (m)			
	B	750 (f)			
Peabody	BM	1,300	BM	4,000	3,600
			M	20,000	10,000
			SB	2,965	10,400
Pittsfield	SA	28,000	....	(Indef)	100,000 (t)
	BI	15,000			
	BC	31,000			
	BM	110,000			
	B	21,000			
	C	2,000			
	WB	4,000			
	G	75.00 (m)			
Provincetown	....	None	....	None	....
Reading	BM	5,000	....	.....	....
Revere	BM	21,000	BM	12,000	15,0[illegible]
	G	100,000	G	10,000	....
	M	50,000	M	5,000	....
	SB	15,000	SB	1,500	5,200
Rockland	....	None	....	None	....
Saugus	BM	6,000	BM	4,000	2,000 (t)
	G	70.00 (m)			
Somerset *	B	None	B	None	....
Somerville	SA	10,410	....	.....	....
	BI	14,689			
	B	17,981			
	C	43,714			
	CT	76,393			
	SB	105,521			
	M	40.87 (m)			
	MI	25.59 (m)			
Southbridge	BM	40,350	BM	5,000	6,200 (t)
	C	825	C	4,500	9,000 (t)
	M	3,000	G	15,400	15,000 (t)
	SB	775	WB	2,000	6,100 (t)
	WB	7,300			
Spencer * *	C	5,670	....	.....	....

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(Continued on page 32.)

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REVIEW OF ROAD AND STREET WORK

Most of this issue is given up to the presentation of data on road and street work in the states, counties, cities and towns of the United States, the statistical matter presented being included in two distinct articles. In each of these there are certain points upon which it may be well to comment briefly here.

Under the heading, "Review of Road Work in the United States during 1915 and Forecast of Work in 1916," are presented such figures as are available relative to work on the roads of the country. In reference to these data it should be noted here that no such compilation of statistics has ever been made covering all highway work in the country—nor is a complete report likely to be made in the near future. Road work in this country is administered in a variety of ways. The work about which the most is known is that performed wholly or in part by the states, acting through state highway departments. The volume of this work is large, as can be seen by reference to the data printed elsewhere, but there is also a very large amount of work done by the smaller units of government—counties, road districts and towns. In those few states which have not yet provided themselves with state highway departments, all work is under the control of these small units, and in all states certain work is similarly administered, its relative amount varying with the degree to which the control of the road work of the state is centralized. The work of counties is especially important in some states, even where there are state highway departments. For instance, some of the county departments in California rank with the departments of some of the states both in thoroughness of organization and in the amount and cost of work performed.

As a rule, the smaller the unit in charge of road work the greater the difficulty of securing statistics on the work. This is doubtless due in many cases to the lack of the requisite records. In addition, the laws of many of the states do not make mandatory the reporting of such statistics to central authorities. In such cases, and in those where no state official department takes the initiative in collecting data, requests for information have to be made to the local authorities. This procedure is always unsatisfactory, as repeated requests often fail to elicit replies. It should be noted, incidentally, that this is true even when the requests come from state officials to whom the law provides that returns must be made.

On account of the conditions described in the foregoing, the review does not include data on certain work, most of which is of relatively little importance. It does comprise, however, a comprehensive survey of conditions and a mass of data which has not been equalled in either completeness or reliability. In almost all cases the facts and figures set forth were obtained directly from those in charge of the work. In other cases the best obtainable data have been used and have been carefully checked, when possible.

Under the caption "Statistics on Paving in Cities of the United States" are presented data on street work in cities, towns and villages of over 3,000 inhabitants. In the principal table (Table I) are shown the amounts of different pavements laid to January 1, 1916, and the amounts and costs of pavements laid and to be laid during this year.

There are in the United States upward of 2,200 cities, towns and villages of over 3,000 inhabitants, of which about 1,200 have populations of 5,000 or more. The information received in reply to thousands of inquiries sent to the street officials and to manufacturers and others in touch with street work throughout the country forms a compilation which is the most complete and accurate of the kind ever published. The number of cities for which data on 1916 work are given is considerably greater than the number in any similar list that has come to our notice.

The goal toward which "Good Roads" has always striven—and always will strive—is rendering to its readers the greatest service in its power, and in working to that end greater efforts have been made each year to secure a larger number of reports. Unusual success has been achieved this year and we are enabled to present to our readers reliable data on work in more than eleven hundred cities, towns and villages. But notwithstanding the fact that these data have never before been equalled we feel that they lack the completeness necessary to give them their maximum value. At present there seems to be no way of obtaining reports from practically every city of importance and for that reason it may be desirable to discontinue this particular feature of the annual review. On the other hand, it may be that during the coming year conditions will so change that it will be possible to secure returns from practically all of the principal cities and so present a review of very real value. In that case "Good Roads" will again undertake the collection and compilation of city paving statistics.

There is another aspect of the matter that has been given due weight in the consideration of this question. It is a tax upon the courtesy of city street officials to ask that they go to the trouble, and sometimes expense, of supplying the requisite figures. While in the majority of cases officials willingly cooperate, we know from some very frank letters we have received that some of them feel that they are being imposed upon. City street officials are busy men and they have not one, but scores, of such requests for information during the course of the year. They are among those whom it is our work to serve; they form no inconsiderable proportion of our readers, and we know that many of them would appreciate any diminution of the requests for information that come to them.

"Good Roads" acknowledges the courteous and helpful replies to inquiries that have been addresesd to state, county, city, township and village highway officials during the preparation of the review. Many of them have taken valuable time to prepare statements and compile data, and to them the editors are especially indebted for their cheerful cooperation.

HIGHWAY LAWS

Four years ago digests of the highway laws of the various states were prepared and printed in the review number of "Good Roads" for that year. Annually since then these digests have been brought up to date and reprinted. In 1913 and 1914, as in 1912, they appeared in the annual review number. Last year, however, the amount of space required for the printing of the city paving data necessitated holding over the law digests until the first issue of the month following that in which the review appeared. The same conditions obtain this year, and it has also been decided to omit the digests altogether. It is felt that the current news covers this feature well enough and that the space required for the digests can be used to better advantage for other matter.

Few state legislatures have met since the digests were printed last year and but few changes, therefore, have been made in the laws. Most of the modifications made in the road laws since the summer of 1915 have been of minor importance, although in a few cases new laws have been passed or existing laws materially amended. Such changes as have been made are, in general, in the direction of more centralized control of work and the extension of the state aid principle. No noteworthy innovations in the method of administration have been inaugurated.

The state aid plan has now been adopted to a greater or less extent by practically every state, and it seems probable that within a few years some of the features of the plan will be of universal application. No state that has given it a fair trial has found it lacking in efficiency when not interfered with by the injection of politics.

As in the past, politics have unfortunately complicated the administration of road work in some localities during the past year. The desirability of eliminating politics from this most important branch of governmental activity is becoming more and more apparent to road builders and students of this work. It is to be hoped that the law makers also will awaken to the necessity of providing for the administration of highway work in accordance with the principles of engineering and business.

New York State Road Map

A map of New York State on which are shown state, county and town highways and points of historical interest has recently been issued by the New York Commission of Highways.

The map is 41 by 35½ ins. in size, the scale being 5 miles to the inch. Completed state and county highways are shown by heavy solid lines and state and county highways under construction by heavy broken lines. Improved town and county roads are indicated by solid light lines, and unimproved town roads by light broken lines. Points of historical interest are indicated by numbers within circles, the numbers referring to numbered paragraphs on the back of the map which briefly describe the various points.

There are about 80,000 miles of road in New York, outside of cities and incorporated villages. About 6,000 miles of completed state and county highways, 1,300 miles of state and county highways under construction, 4,000 miles of improved town and county roads and 6,500 miles of unimproved roads are shown on the map.

NEWS NOTES

That Bad Roads Constitute a Strong Argument for Good Roads is illustrated by the following item from the Mound City (Kan.) "Sentinel": "C. A. Stites, of Farlinville, in Linn County, Kan., called a mass meeting of those opposed to rock roads and only sixteen attended. In a published statement why the crowd was so small, Mr. Stites stated that it was 'on account of the rain and bad roads.'"

A $750,000 Grade Crossing Elimination Project is under way at Pittsburgh, Pa. The work is being done at the intersection of Liberty Ave., one of the main thoroughfares leading from the business section of the city to the residential sections, and the line of the Baltimore & Ohio R. R. The high cost of the work is the result of topographical conditions, the necessity for not interfering with the operation of trains, vehicles or street railways, and the presence of a large city sewer.

That the Motor Vehicle will have a Beneficial Effect upon the City Plan of the Future is one of the conclusions reached by Nelson P. Lewis, Chief Engineer of the Bureau of Estimate and Apportionment of New York City, in a paper presented at the recent Conference on City Planning at Cleveland Ohio. The effect will be beneficial, according to Mr. Lewis, because it will aid in bringing about some of the chief results toward which city planners are striving. Among these results are. (a) the discouragement of further centralization because of the fact that distance may be more readily overcome and less time will be consumed in going to and from work, (b) the diffusion of land values which, while they would be increased in the aggregate, will be less likely to increase to a great extent in one locality and decrease very largely in another, (c) insistence upon better roads and streets which will, in turn, stimulate the improvement of abutting properties, and (d) a better knowledge, on the part of the citizen, of his city and its surroundings through the more general use of the motor car. Another conclusion set forth in the paper is that while the amount of traffic on important thoroughfares will be greatly increased, the motor vehicle's greater speed and reliability will permit a greater volume of traffic to be accommodated safely in the same street provided that the traffic is intelligently controlled, that the width of commercial vehicles is so regulated that the number of traffic lines in a street will not be reduced and that the wheel loads are so restricted as to not exceed the bearing power of the pavement.

Review of Road Work in the United States During 1915 and Forecast of Work in 1916.

Following the custom inaugurated several years ago, "Good Roads" presents in the following pages a review of the highway work accomplished in the several states during the calendar year ending Dec. 31, 1915, and a forecast of the work proposed for the current year.

In this review, as in those printed previously, the figures presented are intended to give a comprehensive idea of the larger and more important accomplishments in the road building field. In almost all of the states there are now state highway departments, and data on work in most of these states can readily be obtained from the state highway authorities. In many cases, however, the state highway commissioners have no record of work other than that under their own supervision. Information from states in which there are no central highway authorities, or in which the state highway authorities do not collect data on local work, has to be obtained by direct inquires addressed to the counties or other local units. In such cases it is not always possible to secure anything like complete returns, partly for the reason that in some instances local authorities do not have the necessary records. Again, even when records exist, it is not always possible to secure information, even the officials to whom by law such information must be given, not always being able to secure it. For these reasons the review and forecast does not cover all the work of construction, maintenance and repair in every state. Such data have never yet been secured and are not likely to be in the near future.

The figures given in the following pages on the expenditures made and to be made have been obtained from a variety of sources, care being taken in every case to secure the most reliable figures available.

ALABAMA

During the year from April 1, 1915, to April 1, 1916, there was expended in Alabama a total of $289,808.88 for state aid roads. During the calendar year of 1915 the county expenditures for roads amounted to $4,047,379.56. Of this amount $1,935,747.15 was expended on roads, from the general fund; $504,978.24 was expended on bridges, from the general fund, and the balance $1,606,654.17 was expended on roads and bridges, from bonds or warrants.

The mileages of roads constructed by state aid during the year from April 1, 1915, to April 1, 1916, are shown in the following table:

Kind of road.	Miles.
Macadam	16.92
Chert	19.17
Gravel	41.50
Sand-clay	62.59
Graded	37.32

The state aid work also included the construction of 1,064.75 lin. ft. of concrete bridges.

The mileages of various kinds of county roads built during the calendar year 1915 are shown in the following table:

Kind of road.	Miles.
Macadam	17.00
Chert	117.90
Gravel	343.50
Sand-clay	515.59
Graded and drained	818.70

County work also included 7,360 lin. ft. of steel bridges and 3,023 lin. ft. of concrete bridges.

According to advices from the State Highway Department, it is impossible to state how much will be expended during the current year or what mileages of different roads will be constructed. It is stated, however, that the expenditure and mileage built will be approximately the same as last year.

The total road mileage of the state is 55,746 miles, of which the improved mileage, 8,613 miles, is divided as shown in the following table:

Kind of road.	Miles.
Macadam	502
Chert	1,241
Gravel	1,673
Sand-clay	2,439
Graded	2,758

ALASKA

For the fiscal year ending June 30, 1916, there was available for road work funds amounting to about $300,000, of which $165,000 was derived from Congressional appropriation. The balance was obtained from taxes levied in the territory. The work consisted very largely of maintenance, the expenditures for that work amounting to approximately 75 per cent. of the total.

Up to the close of the working season last year the roads which had been built and were under maintenance by the Road Commissioners comprised about 900 miles of wagon road, 580 miles of sled road, and about 2,200 miles of trails.

Data on the amount available for the fiscal year of 1916-17 are not available, but it is probable that the expenditures will differ little from those of previous years.

ARIZONA

During the fiscal year ending June 30, 1915, there were expended under the direction of the Highway Department the following sums:

Bridges	$87,011.54
Highways	290,947.12
Engineering	31,446.31
Administration and executive	18,051.50
Equipment	23,738.06
Maintenance	24,983.80

Convicts were used in the construction of highways to a considerable extent during the year. The total number of days of prison labor used under the honor system was 9,072.5, and the total number of working days under guard, 3,583.5. Because of the closing of mining properties in Arizona during the early part of the year and the consequent throwing out of employment of many men, it was deemed advisable to return the prisoners from the guard camp to the prison and employ paid labor instead.

It is estimated that during the fiscal year ending June 30, 1915, the counties expended approximately $575,000.

For the fiscal year of 1915-1916 there was available a total of $1,500,000 divided as follows:

State funds	$425,000
County funds exclusive of bond issue	575,000
County funds from bond issues	500,000

Late in May of this year it was reported that counties had voted bonds to the amount of $1,888,000, and it was estimated that $500,000 of that amount would be expended during the current fiscal year.

ARKANSAS

According to a report by the State Engineer of Arkansas, about $950,000 was expended in 1915 under the improvement district plan and $1,250,000 from the 3-mill road tax.

The expenditures for 1916, according to present estimates, will amount to about $3,040,000, of which $1,300,000 will be obtained from the 3-mill tax.

The mileages of different kinds of road built in the state during 1915 and to be built during 1916 are shown in the table at the top of the next page.

Kind of Road	Mileage Built, 1915.	Mileage to be Built, 1916.
Bituminous macadam	1.0	25.0
Cement concrete (without bit'm's topping)	10.0	85.0
Cement concrete (with thin bit. topping)	5.0	....
Graded road	300.0	600.0
Gravel	95.0	150.0
Water bound macadam	80.0	100 0
Sand-clay	2.0	10.0

CALIFORNIA

Highway work in California is carried out under an $18,000,000 bond issue which was voted in 1910, and with funds secured from automobile registration. As the work is not performed under yearly budgets, it is difficult to secure exact figures for any calendar year. According to a recent statement by State Highway Engineer Austin B. Fletcher, the approximate expenditures of the California Highway Commission for highway construction in 1915 amounted to about $7,021,000, and the approximate expenditure in 1916 will be about $3,000,000.

Kind of Road	Mileage Built, 1912-1915.	Mileage to be Built, 1916.
Bituminous macadam (built by state)	19.1	.....
Bituminous macadam (built by counties, taken over by state)	92.1	.....
Cement concrete (with thin bit. topping)	749.7	200.9
Graded road	303.8	90.9
"Asphalt on concrete"	21.9	.....
"Asphalt on macadam"	11.4	.....

CONNECTICUT

During the year ending September 30, 1915, there was expended for work in which the state participated a total of $2,047,053.19. Of this amount $981,190.43 was expended for new construction, $261,873.62 was expended for reconstruction, and $803,989.14 was expended for maintenance. The expenditures as divided between trunk line work and state aid work were as shown in the following tables:

	Trunk Line Work.	State Aid Work.
New construction	$361,098.52	$620,091.91
Reconstruction	214,174.74	47,698.88
Maintenance	685,946.48	118,042.66

HIGHWAY WORK BY COUNTIES IN CALIFORIA.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Alameda	......	......	92,931	None	100,000(a)	None
Colusa	34,000	106,250	140,250	None	102,000	None
Contra Costa	100,000	25,000	125,000	(b)	150,000	(b)
Del Norte	28,000	3,100	31,100	None	40,000	None
Humboldt	27,000	143,000	170,000	None	200,000	None
Lake	27,656	10,543	38,199	None	......	None
Lassen	......	......	(c)	None	......	None
Mono	4,000	1,000	5,000	None	5,000	None
Monterey	225,000	175,000	400,000	570,000	200,000	None
Napa	42,260	27,570	69,830	None	(d)	None
Riverside	......	16,000	16,000	None	374,000	740,000(e)
San Bernardino	960,000	100,000	1,160,000	None	950,000	None
San Diego	......	......	237,013(f)	None	......	(g)
San Joaquin	150,000	27,765	177,765	None	175,000	None
San Mateo	980,000	170,000	1,150,000(h)	(i)	240,000	200,000(j)
Santa Clara	178,444	51,205	229,649	None	200,000	None
Santa Cruz	119,306	......	119,306	None	106,000(a)	None
Shasta	......	28,000	28,000	40,000	......	....
Stanislaus	50,000	50,000	100,000	None	100,000	1,500,000(e)
Tulare	210,000	88,000	298,000	None	377,000	2,800,000
Ventura	150,000	60,000	210,000(f)	1,000,000	1,150,000	None

(a) Approximately; (b) Appropriations made from general fund; (c) Figures not available until end of fiscal year, July 1, 1916; (d) Amount available about the same as in 1915; (e) Bond issue undecided at date of advice; (f) Amount expended during fiscal year June 30, 1915, to June 30, 1916; (g) County voted against $2,000,000 bond issue; (h) Built 99.21 mi. different kinds of road; (i) Issued bonds to amount of $1,200,000 for both roads and bridges in 1913; (j) Raised by direct tax for roads.

HIGHWAY WORK BY COUNTIES IN COLORADO.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Alamosa	18,500	1,500	20,000	None	14,000	None
Arapahoe	7,000	15,000	22,000	None	38,500	None
Archuleta	......	......	21,582	......	12,000	None
Bent	......	......	17,689	None	17,232	None
Elbert	......	......	22,700	None	1,500	None
Fremont	65,000	......	65,000	None	50,000	None
Garfield	60,000	15,000	75,000	None	87,000	None
Gunnison	......	......	36,000	None	40,000	None
Kit Carson	8,000	1,000	9,000	None	16,000	None
La Plata	......	......	30,000	None	41,000	None
Montezuma	17,500	7,500	25,000	None	25,000	None
Prowers	27,103	8,312	35,415	None	50,000	None
Pueblo	63,562	20,843	84,405	None	113,600(a)	None
Rio Grande	......	......	20,000	None	30,000	None
San Miguel	......	......	42,000	None	35,000	None
Summit	14,000	3,000	17,000	None	17,000(b)	None
Teller	36,000	......	36,000(c)	None	48,000	None

(a) County road fund $85,000, state road fund $28,220; (b) Approximately; (c) Mostly for roads.

In addition to the expenditures made by the state through the State Highway Department, large amounts are spent by the counties, some of which have well organized highway departments and do extensive work on county systems. One of the accompanying tables shows the expenditures made in those counties from which reports have been received.

The mileages of different kinds of road built under the supervision of the California Highway Commission under the $18,000,000 bond issue of 1910 are shown in the accompanying table. It should be noted that the mileage shown in the first column is that constructed in 1912-1915;

The total mileage of roads constructed and reconstructed during the year was 163.07.

The legislature of 1915 made no appropriation for new work and on Oct. 1, 1915, the total amount available for new work, both state aid and trunk line, was slightly over $300,000.

COLORADO

According to a report from the State Highway Commissioner of Colorado, the total expenditure for road work in the state during 1915 was about $1,725,000. Of this amount $725,000 was expended on state roads by the state and by the counties, the state's portion being $225,000. The sum of $1,000,000 was spent by the counties on county roads.

The expenditures for the current year will be greater, a statement from the Commissioner placing the total at $2,130,000. Of this amount, $1,100,000 will be expended by the counties on county roads and the balance, $1,030,000, will be expended on state roads by the state and the counties, the state expending $620,000.

Data on work in some of the most active counties are shown in one of the accompanying tables.

The mileages of different kinds of road built in 1915 and to be built in 1916 in Colorado are shown in the accompanying table. The roads covered are state and county roads outside of the corporate limits of cities:

Kind of Road	Mileage Built, 1915.	Mileage to be Built, 1916.
Cement concrete (without bit. topping).....	8.0	4.8
Graded road	1,180.0	1,500.0
Gravel	107.0	12.0
Water bound macadam....................	3.0	....
Sand-clay	8.0	10.0
"Tarvia on gravel"..........................	.5	....
Shale	25.0	10.0

DELAWARE

Kent County.—During 1915, Kent County secured state aid to the extent of $10,000. This, with county funds amounting to considerably more, was expended for the construction of roads under the supervision of the Road Engineer's office as shown in the following table in which the mileages of different kinds of road to be built during 1916 are also shown:

Kind of Road	Mileage Built 1915	Mileage to be Built 1916
Bituminous macadam	2.0	....
Graded road	30.0	50.0
Gravel	10.0	30.0
Water bound macadam............	5.0	2.0
Sand-clay	12.0	15.0

New Castle County.—It is estimated that the expenditure for road work in New Castle County in 1915 was about $170,000. The total expenditure for 1916 will be about $200,000, according to a recent report.

Sussex County.—During 1915 a total of about $70,000 was expended for road work in Sussex County. About the same amount will be expended in 1916. The mileages of different kinds of county roads built during 1915, and the estimated mileages to be built during 1916 are shown in the following table:

Kind of Road	Mileage Built 1915	Mileage to be Built 1916
Graded road	20.0	20.0
Gravel	10.0	10.0
Sand-clay	5.0	....

FLORIDA

Although the Legislature of 1915 created a State Road Department to act in an advisory capacity, the newly organized department has not gathered detailed statistics on the expenditures made in the state. A report from Assistant Secretary J. P. Clarkson of the State Road Department states that during the year of 1914 a total of approximately $1,668,000 was expended for road work in the counties of the state, exclusive of that expended from the proceeds of bond issues, which amounted to at least $2,000,000. It is probable that the expenditures for 1915 were somewhat greater than this, the total being approximately $4,000,000.

The approximate mileages of different kinds of road built in Florida during 1915 and to be built during 1916 are shown in the accompanying table. The roads covered are public roads in counties, built by funds derived from bond issues, from direct taxation, etc.:

Kind of Road	Mileage 1915. Built,	Mileage to be 1916. Built,
Bituminous macadam	10	25
Brick	150	200
Cement concrete (without bit. topping)......	25	50
Cement concrete (with thin bit. topping)....	80	50
Graded road	400	400
Water bound macadam	75	100
Sand-clay	400	500
Shell	100	50
Sand-asphalt	125	340
Sand-oil	25	100
Miscellaneous	200	300

HIGHWAY WORK BY COUNTIES IN FLORIDA.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Gadsden	13,000	1,000	14,000	None	24,000	None
Jackson	15,000	5,000	20,000	None	20,000	None
Monroe	......	......	......	......	(a)	(a)
Pinellas	......	......	......	715,000	715,000 (b)	None
Polk	......	......	......	......	......	1,500,000
Saint Lucie	75,000	......	75,000	None	100,000	None
Seminole	......	......	200,000	450,000	250,000	None
Taylor	......	......	12,000	None	15,000	(c)
Volusia	......	......	......	1,000,000	1,000,000	25,000

(a) Advices from Monroe County are to the effect that surveyors are now at work projecting a road from Cape Sable to connect with Dade County road, also roads on Key Largo, Big Pine Key and probably other keys. Until their work is completed, the length of roads and probable cost will not be known. When routes are determined and cost ascertained, a bond election will be held; (b) Contract was let for 73 mi. of brick road; (c) Expect bonds to be voted, amount not given.

Data on work in those counties from which reports have been received are shown in one of the accompanying tables.

GEORGIA

As there is no central authority to which the various counties in Georgia are obliged to make returns, exact figures on work in the state are not obtainable. According to a statement from the Geological Department of the state, the total expenditure on the public roads of Georgia during 1914 (the last year for which complete data had been obtained), was $3,650,000, and it is stated that figures on the expenditures for 1915 and 1916 will probably be somewhat greater.

The only money paid by the state for road purposes consists of the automobile taxes. In 1915 the amount collected from this source and distributed to the counties was $110,000.

Convicts are used on road work in Georgia to a considerable extent. The Prison Commission appoints wardens and camp physicians, and assigns the convicts to the various counties on a basis of the population of the counties. According to a statement furnished by the Prison Commission early in May of this year, there were at that time 133 counties working convicts on their roads.

Data on the work in those counties from which reports have been received are shown in a table on the next page.

IDAHO

The total expenditure on state highway work in Idaho in 1915 amounted to $474,636.21. In 1916 there will be expended approximately $359,000 on state highway work, of which $30,000 will be used for maintenance. Advices from the State Highway Department are to the effect that the state highway fund is almost depleted this year, and that the counties are paying the entire cost of the work, with the understanding that the state will reimburse them to the extent of one-third of the cost as soon as funds are available.

No records of the amount of money spent by the counties during 1915 are available. Figures for the two previous years, however, showed an expenditure by the counties of about $1,000,000 in 1915 and $750,000 in 1914.

Data on work in counties from which reports have been received are shown in one of the accompanying tables.

HIGHWAY WORK BY COUNTIES IN GEORGIA.

County.	1915 Work Expenditures Roads.	 Bridges.	 Total.	 Total amount of bonds voted.	1916 Work Total amount available for roads and bridges.	 Total amount of bonds voted and to be voted.
Appling	7,000	2,000	9,000	None	9,000	None
Bacon	1,000	1,000	2,000	None	6,000	75,000(a)
Baldwin	......	......	26,550	None	25,000	None
Banks	8,000	5,000	13,000	None	1,000	None
Burke	25,000	10,000	35,000	None	35,000	None
Calhoun	15,000	5,000	20,000	None	20,000	None
Chattahoochee	7,000	1,000	8,000	None	6,000	None
Chattooga	12,792	2,390	15,182	None	15,000	None
Cherokee	25,929	4,642	30,571	None	30,000	None
Clay	8,000	4,000	12,000	None	15,000	None
Clayton	......	......	......	......	(b)	....
Columbia	13,000	2,000	15,000	None	16,000	None
Crawford	11,000	2,000	13,000	None	14,500	None
Dawson	2,000	1,000	3,000	None	2,000	None
Dekalb	121,360	5,664	127,024	None	60,000	None
Dodge	29,438	5,028	34,466	None	35,000	None
Dooly	12,000	7,500	19,500	None	......	None
Dougherty	23,000	2,000	25,000	None	25,000	None
Early	30,000	10,000	40,000	None	40,000	None
Echols	......	......	......	None	None	None
Evans	......	......	......	......	7,500	None
Floyd	68,000	9,000	77,000	225,000(c)	313,000	None
Forsyth	4,161	3,751	7,912	None	......	None
Fulton	489,150	2,864	492,014	None	500,000(d)	None
Hancock	......	......	16,268	None	17,000	None
Houston	......	......	30,000	None	30,000	None
Jeff Davis	7,000	1,000	8,000	None	7,000	None
Jefferson	20,000	5,000	25,000	None	30,000	None
Johnson	3,254	2,055	5,309	None	......	....
Laurens	18,000	22,000	40,000(e)	None	25,000(d)	None
Lowndes	......	......	30,000	None	40,000	None
McIntosh	......	......	10,000	20,000	20,000	None
Montgomery	25,000	10,000	35,000	None	35,000	None
Oconee	7,000	3,000	10,000	None	(f)	None
Polk	25,000+	8,000+	33,000+	None	35,000	None
Rabun	4,000	6,000	10,000	None	(g)	None
Richmond	......	......	78,446	None	......	None
Schley	8,500	1,000	9,500	None	11,000	None
Stewart	12,000	3,000	15,000	None	17,500	None
Taylor	12,964	5,378	18,342	None	20,000	None
Terrell	......	......	25,000(d)	None	25,000(d)	None
Thomas	30,000	10,000	40,000	None	40,000	125,000(c)
Twiggs	12,567	......	12,567	None	15,000+	None
Upson	25,000	5,000	30,000	None	30,000	None
Walker	15,000	5,000	20,000	None	25,000	None
Walton	21,491	6,330	27,821	None	None	None
Wayne	......	......	19,000(d)	None	20,000	None
Webster	19,153	1,930	21,083	None	......	None
Wilkinson	15,000	5,000	20,000	None	20,000	None

(a) Bond issue being considered at date of advice; (b) Figures will not be known until 1916 taxes are collected; (c) For bridges; (d) Approximately; (e) 375 mi. of sand-clay road; (f) About the same amount as was spent in 1915; (g) Levy not made at date of advice.

HIGHWAY WORK BY COUNTIES IN IDAHO.

County.	1915 Work Expenditures Roads.	 Bridges.	 Total.	 Total amount of bonds voted.	1916 Work Total amount available for roads and bridges.	 Total amount of bonds voted and to be voted.
Benewah	19,000	1,000	20,000	None	23,000	(a)
Boise	28,001	8,967	36,968	None	......	None
Bonner	56,175	17,379	73,554	None	75,000	None
Boundary	7,500	2,600	10,100	None	21,000	None
Canyon	42,381	5,520	47,901	None	47,901(b)	None(c)
Fremont	24,776	3,000	27,776(d)	None	......(e)	None
Gem	2,271	......	2,271	None	7,500	None
Idaho	13,500	2,500	15,000	None	......	None
Lemhi	17,791	2,276	20,067	None	20,000	None
Madison	12,203	3,381	15,584	None	14,000	None
Nez Perce	33,247	1,913	36,160	(f)	35,000	150,000(g)
Owyhee	13,156	2,989	16,145	None	......	None
Shoshone	......	......	37,784	None	60,000	None

(a) Bond issue contemplated at date of advice; (b) Approximately; (c) Special levy of $17,500 made to construct bridge at Parma; (d) Does not include highway district roads; 27 mi. gravel and clay and 3 mi. of volcanic cinder were constructed; (e) 1916 levy not made at date of advice; (f) Some districts voted bonds; (g) Voted by Lewiston Highway District.

The approximate mileages of different kinds of state highways built in 1915 and to be built in 1916 are shown in the accompanying table. The state pays one-third of the cost of the construction of these roads and the counties two-thirds. After completion, the roads are maintained at the expense of the state.

Kind of Road	Mileage Built, 1915.	Mileage to be Built, 1916.
Graded road	200	260
Gravel	24	...
Sand-clay	5	...

INDIANA

The following statement from the State Bureau of Statistics contains the available information on road work in the state at large during 1915:

Gravel road construction	$7,705,500.27
Paid on gravel road bonds	6,291,711.08
Gravel road repairs	2,747,089.51
Bridge construction	1,456,176.93
Bridge repairs	293,745.19
Bridge engineers	29,247.69
Surveyors	36,732.41
Viewers and damages	27,209.77
Township gravel road bonds outstanding Jan. 1, 1916	$37,493,609.54
Free gravel road Jan. 1, 1916	29,550 miles
Road tax worked out and expense on township roads (three counties estimated)	$2,500,000.00

Information on probable expenditures for 1916 is not available at present.

Data on work in those Indiana counties from which reports have been received are shown in one of the accompanying tables.

ILLINOIS

Up to the close of 1915 there had been expended for state aid work a total of $1,578,505. Half of this amount was paid by the state and the remainder by the counties. Information as to the portion of this amount expended during the calendar year of 1915 is not available as contracts for much of the work were awarded in 1914, the work being completed during 1915.

During 1915 there was levied for road and bridge purposes in Illinois the sum of $8,332,119.

During 1916 there will probably be expended $2,000,000 for state aid work, $1,000,000 being paid by the state and the balance by the counties. The levies for local work will probably be somewhat larger than those of last year. In addition a considerable amount of work will be done with the proceeds of bond issues, various townships in the state having voted township bonds this year to the amount of approximately $1,000,000.

HIGHWAY WORK BY COUNTIES IN INDIANA.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Allen	323,610	105,082	428,692	None	175,000	None
Blackford	87,656	4,548	92,204	60,767	30,500	None
Clay	......	......	32,800	60,000	75,000	72,000
Clinton	32,114	8,357	40,471	......	43,000	......
Dearborn	70,200	700	70,700	None	60,000	None
Dekalb	43,000	12,000	55,000	43,000(a)	......	(a)
Delaware	28,000	5,000	31,000(e)	None	27,000	None
Fulton	12,168	8,146	20,314	None	7,471	None
Greene	32,000	13,000	45,000	None	37,000	....
Hamilton	293,523	22,215	315,738	None	400,000	....
Huntington	26,113	23,694	49,807	......	21,163	....
Jennings	17,534	......	17,534	None	17,000	None
Lake	490,698	40,876	531,574	335,000	......	10,000(b)
Martin	......	......	......	None	4,500	None
Miami	30,424	11,224	41,648	None	64,000	None
Owen	18,000	6,000	24,000	......	......	....
Parke	34,000	3,000	37,000	None	40,000	None
Pike	8,000	2,000	10,000	None	11,000	....
Posey	17,000	4,000	21,000	45,000(a)	18,000	24,000(a)
Pulaski	20,000	20,385	40,385	None	40,000	None
Putnam	44,889	......	44,889	......	......	....
Ripley	32,000	5,300	37,300	None	2,400	None
Saint Joseph	......	......	92,000	None	......	None
Spencer	3,500	......	3,500	None	4,000	None
Starke	......	......	31,405	None	35,000	....
Sullivan	100,552	17,188	117,740	None	100,000	None
Tippecanoe	......	......	(c)	......	......	....
Tipton	32,507	2,411	34,918	17,231	35,000	26,208(a)
Union	8,000	12,000	20,000	None	10,000	None
Vanderburg	23,497	18,433	41,930	None	60,000	None
Vigo	......	......	26,863	None	40,000	None
Wabash	43,994	3,796	47,790	75,320	40,000	45,000
Warrick	60,000	6,640	66,640	(d)	120,000	(d)
Washington	25,000	30,000	55,000	None	20,000	None
Wayne	38,818	24,013	62,831	None	50,000	100,000(a)

(a) For roads; (b) For bridges; (c) No data available; (d) Bonds were voted; (e) Estimate.

The mileages of various kinds of state aid roads built up to the close of 1915 and the estimated mileages of such roads to be built in 1916 are shown in the table which follows. In this connection it should be noted that the figures for 1916 work in the foregoing table are approximate estimates based upon the amount of money available, the types of road selected by the various counties, and the estimated costs of construction of the various kinds of roads selected.

Kind of Road	Mileage Built to 1916	Mileage to be Built 1916
Brick	27.80	11.00
Concrete	106.90	58.00
Water bound macadam	1.06	5.00
Bituminous macadam	....	6.00
Gravel	3.20	22.00
Earth	....	120.00
Oiled earth	....	250.00

IOWA

The total expenditure for road and bridge work in Iowa during 1915 was approximately $13,525,000. Of this amount, $6,629,000 was expended for bridges and culverts, $3,396,365 for county road work, and the balance, $3,500,000, for township road work.

During the period from Nov. 1, 1914, to Jan. 1, 1916, there was expended for county work $3,396,365, which was divided as shown in the following table:

Permanent work	$1,159,764
Repair and maintenance	1,143,382
Tractor grading	359,205
Filling bridges and culverts	249,016
Road machinery	205,123
Road materials	22,797
Unreported and unclassified	257,078

The mileages of different kinds of road built in Iowa in 1915 and to be built in 1916 are shown in the accompanying table:

Kind of Road	Mileage Built, 1915.	Mileage to be Built, 1916.
Cement concrete (without bit. topping)	2.0	1.0
Graded road	462.6	"No data"
Gravel	179.0	"
Sand-clay	1.0	"

In regard to township expenditures it is stated that it is impossible to get an accurate report. There are about 1,650 townships in the state and reports were obtained from about 1,050. These reports indicate a total expenditure of $3,500,000, as previously stated. Of the $6,629,000 expended for bridges and culverts, $4,079,000 was expended for what are classed as permanent bridges and culverts. These include structures composed entirely of masonry or steel. Of the balance, $1,091,000 was expended for temporary bridges and culverts.

$1,212,000 for repair work, and the balance for miscellaneous expenditures.

It is probable that the total expenditure in 1916 will be somewhat larger than that in 1915.

KANSAS

The total expenditure for road work in Kansas during 1915 was about $5,500,000, practically all of it being from county and township funds.

It is estimated that the total expenditure in 1916 will be about $5,750,000.

KENTUCKY

According to a recent report from the Department of Public Roads of Kentucky, the total amount collected for road work during 1915 including bonds issues was about $2,000,000. It is also stated that between $4,000,000 and $5,000,000 will probably be spent in the state for the improvement of roads during the current year. Of this amount $750,000 will be paid by the state.

The mileages of different kinds of roads built in Kentucky during 1915 and to be built during 1916, are shown in the accompanying table. The roads listed include state aid roads and roads in counties in which bonds have been issued for road improvement.

Kind of Road	Mileage Built 1915.	Mileage to be Built 1916.
Bituminous macadam	26.37	....
Brick	2.37	1.50
Cement concrete (without bituminous topping)	2.00	....
Graded earth road	179.81	....
Water bound macadam	336.77	24.44
Water bound macadam reconstruction	259.42	34.17

LOUISIANA

During 1915 approximately $540,000 was expended for the construction of state aid roads in Louisiana. Of this total cost, $101,000 was paid by the state. No figures are available on the amount spent independently of the state, but it is known that the local expenditures amount to about $5,000,000 annually.

The mileages of various kinds of road built by state aid in 1915 and to be built in 1916 are shown in the following table:

Kind of Road	Mileage Built 1915	Mileage to be Built 1916
Cement concrete (without bituminous topping)	.25	....
Graded road	52.00	55.00
Gravel	124.84	200.00
Shell	....	5.00

It is estimated that in 1916 about $600,000 will be expended for state aid work. Of this amount the state will pay about $150,000.

MAINE

The total of all funds expended during 1915 by the State Highway Department of Maine and under its supervision amounted to $1,418,901.62, of which the state furnished $1,009,345.41 and the cities and towns furnished the remainder. There was expended upon state highways $512,232.74, all of which was furnished by the state. This was used for the construction of 86.18 miles of road. In addition 9 bridges were built at a total cost of $32,646.60. A total of $589,466.73 was expended for the construction of 160 miles of state aid road, the cost being borne by the state and the towns. There were also built 9 bridges at a cost of $13,513.53. During the year 955.5 miles of road were maintained at a total expenditure of $170,467.76.

For 1916 there is available for the construction of state highways the sum of $500,000, furnished by the state. There is also available from the state $300,000 for the construction of state aid highways. This will be supplemented by an equal amount furnished by the towns and cities. It is probable that the expenditures for maintenance will amount to $250,000, all of which will be furnished by the cities and towns, the work being done under the supervision of the State Highway Commission.

The State Highway Commission is undertaking this year the maintenance of all main thoroughfares in the state, both improved and unimproved, comprising a total of 4,000 miles of road. The work is being done by the patrol system, approximately 500 patrolmen being employed.

In the following table are shown the mileages of different kinds of road built as state highways and state aid highways in 1915, and the mileages of different kinds of road to be built as state highways in 1916. The state aid highway mileage built in 1916 will be about the same as that built in 1915.

Kind of Road	Mileage Built 1915 State H'way	Mileage Built 1915 State Aid H'way	Mileage to be Built 1916 State Highways
Bituminous macadam	9.20	2.87	....
Cement concrete (without bituminous topping)	7.56	....	4.12
Cement concrete (with thin bituminous topping)	....	1.44	....
Graded road	....	9.04	....
Gravel	56.89	134.42	61.20
Water bound macadam	5.78	3.27	1.80
Sand-clay	6.75	.56	.....
Miscellaneous	....	.46	....

HIGHWAY WORK BY COUNTIES IN MARYLAND.

County.	1915 Work				1916 Work	
	Expenditures					
	Roads.	Bridges.	Total.	Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
Allegany	......	......	84,294	None	90,000	None
Baltimore	598,735	26,461	625,196	None	527,563	None
Carroll	35,000	5,000	40,000	None	40,000	None
Dorchester	50.384	8,566	58,950 (a)	None	64,325 (b)	None
Garrett	18,700	4,394	23,094	None	18,876	None
Howard	35,000	9,761	44,761	None	51,000	None
Montgomery	101,103	3,218	104,321	15,000 (c)	182,500	209,000 (c)
Somerset	7,000	20,000	27,000	None	25,000	20,000 (d)
Wicomico	50,000	40,645	90,645 (e)	None	40,000 (e)	None

(a) For fiscal year, July 1, 1915, to May 1, 1916; (b) For fiscal year May 1, 1916, to May 1, 1917; the amount levied for state aid roads ($12.500) will be increased by a similar amount from the state and 10 per cent. of the total from benefited property owners; this county has approximately 725 mi. of roads of which 15 are state and state aided concrete, about 40 mi. of state and state aid macadam, surface treated with asphalt, oil or tar, 160 mi. of oyster shell road, of which about 13 mi. are state aid, and the remainder county roads; approximately, 200 mi. have been graded, crowned with road machine and properly drained; the remainder are unimproved. (c) For roads; (d) For bridges; (e) Approximately.

MARYLAND

According to a report from the State Roads Commission the total expenditure for work done by the commission during 1915 amounted to approximately $1,000,000. The corresponding expenditure for 1916 will probably amount to $1,300,000.

Data on county work in those counties from which reports have been received are shown in the accompanying table.

The mileages of different kinds of state and state aid roads built under the direct supervision of the State Roads Commission of Maryland during 1915, and to be built during 1916 are shown in the following table:

Kind of Road	Mileage Built 1915.	Mileage to be Built 1916.
Bituminous concrete	15.0	....
Brick	2.0	....
Cement concrete	261.0	75.0
Gravel	137.0	10.0
Water bound and bituminous macadam (penetration method)	750.0	50.0
Miscellaneous	33.0	25.0

MASSACHUSETTS

During 1915 the total amount expended by the Massachusetts Highway Commission for construction including the amounts contributed by the towns was $1,910,572, and the amount expended for repairs, maintenance and reconstruction was $1,026,222, making a total of $2,936,794.

The total amount available for construction in 1916 is $2,163,000, not including amounts which may be contributed by the towns.

The mileages of different kinds of roads built by or under the supervision of the Massachusetts Highway Commission during 1915 are shown in the following table:

Kind of road	Mileage Built 1915.
Bituminous concrete	12.69
Bituminous macadam	38.62
Cement concrete (without bituminous topping)	5.34
Graded road	6.70
Gravel	58.60
Water bound macadam	23.26
Miscellaneous	36.71

MICHIGAN

The state appropriation for work in Michigan in 1915 amounted to $1,000,000.

The mileages of different kinds of state aid road built during 1915 and to be built in 1916 are shown in the following table:

Kind of Road	Mileage Built 1915	Mileage to be Built 1916
Cement concrete (without bituminous topping)	32.0	36.0
Gravel	48.9	53.9
Water bound macadam	142.0	146.0
Sand-clay	24.0	46.0
Miscellaneous	72.0	74.0

The state appropriation for 1916 is $500,000, in addition to which there will be received from the automobile tax an amount estimated at about $750,000.

Information on work in those counties from which reports have been received is included in one of the accompanying tables.

MINNESOTA

The total expenditure for road and bridge work supervised by the State Highway Commission in 1915 was approximately $3,748,660 of which about $500,000 was expended for bridges and $497,531.10 was expended for maintenance. The balance was spent for the construction of culverts, for clearing, ditching, grading, surfacing, and other items.

The total expenditure for similar work in 1916 is estimated at $4,500,000. Of this amount it is estimated that $750,000 will be expended for bridge construction and the balance for road work.

The mileage of state aid roads of various kinds built in 1915 and to be built in 1916 is shown in the table at the top of the next page.

HIGHWAY WORK BY COUNTIES IN MICHIGAN.

County.	1915 Work: Expenditures: Roads.	1915 Work: Expenditures: Bridges.	1915 Work: Expenditures: Total.	1915 Work: Total amount of bonds voted.	1916 Work: Total amount available for roads and bridges.	1916 Work: Total amount of bonds voted and to be voted.
Alpena	30,000	3,000	33,000	None	25,000	None
Baraga	2,000	......	2,000	None	6,000	....
Branch	24,000	1,000	25,000	None	50,000	None
Calhoun	66,000	......	66,000	None	55,500	None
Cass	32,000	......	32,000	None	30,000	None
Cheboygan	41,895	1,813	43,708	None	50,000	None
Clinton	......	......	33,533	None	30,000	None
Delta	74,000	9,000	83,000	None	120,000	100,000(a)
Dickinson	31,641	4,567	36,208	None	24,000	None
Eaton	29,800	200	30,000(b)	None	60,000	None
Emmet	30,307	......	30,307	None	31,800	None
Gladwin	22,000	4,000	26,000	None	54,000	None
Gogebic	58,000	2,000	60,000	None	77,000	None
Grand Traverse	28,000	......	28,000	None	27,500	None
Gratiot	......	......	(c)	......	......	....
Houghton	40,553	......	40,553	None	100,000	None
Ingham	62,500	500	63,000(b)	None	115,000	None
Iosco	......	......	10,512	None	10,000	None
Iron	115,000	10,000	125,000	None	74,000	None
Isabella	38,000	12,000	50,000	None	45,000	None
Kalkaska	10,000	......	10,000	None	......	None
Lenawee	......	......	(c)	245,000(a)	......	110,000(a)
Luce	39,963	1,406	41,369	None	56,000	None
Mackinac	63,269	7,254	70,523	None	90,000	75,000(a)
Macomb	51,000	......	51,000	None	51,000	40,000
Marquette	50,000	......	50,000	None	50,000	None
Menominee	54,231	......	54,231	None	36,787	None
Oakland	129,000	......	129,000	None	380,000	1,000,000(a)
Osceola	......	......	......	(c)	......	....
Ottawa	......	......	100,000	None	63,500	None
Presque Isle	......	......	......	None	......	None
Roscommon	......	......	None	None	......	75,000(d)
Saint Joseph	25,000	......	25,000	None	30,000	None
Shiawassee	43,000	......	43,000	None	......	None(e)
Van Buren	......	......	......	......	(f)	....
Washtenaw	......	......	63,000	None	45,000	None
Wayne	......	......	375,000	None	600,000	None
Wexford	16,000	......	16,000	None	15,000(g)	....

(a) For roads; (b) Approximately; (c) Has no county road system, and no statistics are available; (d) State reward roads; (e) Roads are built under assessment district law; (f) County road system only recently established; no construction work will be done this year; (g) For official county work only—township information not available.

Kind of Road	Mileag› built, 1915.	Mileage to be built, 1916.
Brick	1.0	4.0
Cement concrete (without bit. topping)	.5	1.0
Graded road	1,997.3	2,500.0
Gravel	497.6	700.0
Water bound macadam	5.1	35.0
Sand-clay	143.9	150.0

MISSISSIPPI

While a State Highway Department has been established in Mississippi during the past year, it has not yet undertaken the compilation of statistics on road work in the state. Data on work in those counties from which reports have been received are shown in one of the accompanying tables.

MISSOURI

According to information received from the State Highway Department of Missouri the total expenditure for road and bridge work in the state for 1915 was between $5,000,000 and $6,000,000.

The amount of the state aid fund for permanent improvement to be distributed among the different counties for 1916 is $250,000.

There are about 200 special road districts in the different counties and in a number of these bonds ranging in amount from $25,000 to $100,000 have been voted for road purposes. In addition county road bond issues have been voted as follows: Clay County, $3,250,000; Jefferson County, $500,000; St. Louis County, $3,0000,000; Wayne County, $200,000.

Data on the work in those counties in Missouri from which reports have been received are included in one of the accompanying tables.

MONTANA

The following table furnished by the Department of Highways of Montana contains the available data on expenditures for road work in the state during 1915:

Total Road Expenditures	$2,483,077.49	
Total Bridge Expenditures	844,363.83	
Total		$3,327,441.32
Warrants Outstanding (Road)	1,078,152.52	
Warrants Outstanding (Bridge)	218,790.53	
Total		1,296,943.05
Total Warrants Outstanding and Warrants paid		$4,624,384.37

HIGHWAY WORK BY COUNTIES IN MISSISSIPPI.

County.	1915 Work: Expenditures: Roads.	Bridges.	Total.	Total amount of bonds voted.	1916 Work: Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
Amite	9,298	1,658	10,956	None	15,000	300,000(a)
Benton	8,724	2,469	11,193	None	14,360	None
Calhoun	35,814	8,791	44,605	None	......	None
Chickasaw	300,000	80,000	380,000(e)	None	56,000	(f)
Claiborne	7,890	4,110	12,000	None	......	None
Copiah	235,000	13,224	248,224	150,000(a)	125,000	28,500(a)
Franklin	8,438	3,315	11,753	None	12,000	None
George	.....	......	13,124	None	None	None
Hinds	250,000	50,000	300,000(b)	200,000	180,000	175,000
Holmes	.....	......	......	......	525,000	475,000
Kemper	27,185	6,930	34,115	None	25,000	120,000(a)
Marshall	40,000	10,000	50,000	None	......	400,000(c)
Panola	.....	......	42,000	......	......	....
Pontotoc	.....	......	......	......	168,000	168,000(a)
Quitman	.....	......	40,000	None	......	(d)
Winston	.....	......	28,975	None	......	130,000

(a) For roads; (b) Amount shown was spent in 1914 instead of 1915; (c) Approximate; (d) Expects to vote road bonds; (e) Represents expenditures for 1912-13-14-15; (f) Bonds were voted in Districts 1 and 4, amounts not given.

HIGHWAY WORK BY COUNTIES IN MISSOURI.

County.	1915 Work: Expenditures: Roads.	Bridges.	Total.	Total amount of bonds voted.	1916 Work: Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
Atchison	10,000	25,000	35,000	None	35,000(b)	None
Audrain	26,000	24,000	50,000	None	55,000	None
Barton	.....	4,000	4,000	None	4,000	(a)
Boone	12,478	8,872	21,350	None	20,000	None
Buchanan	99,567	54,712	154,279	None	160,000	None
Cole	10,303	16,807	27,110	None	24,000	None
Dallas	12,758	1,445	14,203	None	9,000	12,000
Dunklin	20,000	13,000	33,000(b)	None	30,000	300,000(b)
Greene	21,500	23,500	45,000	36,700(d)	180,000	25,000
Henry	25,000	10,000	35,000	None	40,000	None
Laclede	13,500	1,500	15,000	None	15,000	None
Marion	40,000	20,000	60,000	......	60,000	....
Miller	......	......	......	None	10,000	....
Monroe	25,000	25,000	50,000	None	45,000	None
Newton	20,098	4,500	24,598	None	25,000(b)	None
Nodaway	(c)	25,000	25,000	35,000	25,000	....
Osage	40,000	20,000	60,000	None	40,000	None
Phelps	14,834	3,917	18,751	None	20,605	None
Pike	23,901	12,350	36,251	None	36,000	None
Pulaski	.....	......	10,373	None	14,020	None
Putnam	4,264	......	4,264	None	......	None
Ralls	....	......	17,081	None	15,000	None
Saint Francois	18,000	17,000	35,000	None	40,000	None
Saint Louis	343,662	20,150	363,812	None	4,000,000	3,000,000
Shannon	13,000	......	13,000	None	11,000	....

(a) Bond issue contemplated at date of advice; (b) Approximately; (c) Roads are built by township; (d) By special districts.

The following statement relative to the probable expenditures during the current year was received from the Department:

> The assessed valuation of the state last year was $439,000,000. It is reasonable to suppose that there will be a rise of about $25,000,000, which would make the valuation in the state for taxation purposes in round numbers $464,000,000. Figuring that the general average levy for road purposes will be six mills on a dollar, would give a fund of approximately $2,780,000, to which would be added the special tax collected from laborers and other non-taxpayers. This would probably raise the available money to close to $3,000,000. To this must be added the bridge levy which will probably bring the total close to $4,500,000. These figures, however, are merely estimates.

The mileages of different kinds of roads built in the state during 1915 and to be built during 1916 are shown in the following table:

Kind of Road	Mileage built. 1915.	Mileage to be built. 1916.
Graded Road (estimated	1,500	1,800
Gravel	75	250

NEBRASKA

There is no central authority having supervision of road work in Nebraska. The work done in those counties from which reports have been received is set forth in one of the accompanying tables.

NEVADA

There is no central authority having charge of road work in Nevada. There is available only the information secured from county authorities. Data on work in those counties from which reports have been received are shown in one of the accompanying tables:

During 1916 there will be available $550,000 for construction and $350,000 for maintenance.

NEW YORK

The total expenditure for the improvement and construction of state and county highways made by the State Highway Commission of New York during 1915 was approximately $11,000,000. In addition there was expended for maintenance and repair of state and county roads approximately $4,000,000, and for the improvement, maintenance and repair of town highways approximately $3,800,000.

The Legislature has set aside from the $50,000,000 bond issue $10,000,000 for construction work during 1916. It is stated that this amount will probably be used for the construction and improvement of new state and county highways, and that in addition $4,000,000 will be spent for the maintenance of completed state and county highways.

HIGHWAY WORK BY COUNTIES IN NEBRASKA.

	1915 Work				1916 Work	
	Expenditures					
County.	Roads.	Bridges.	Total.	Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
Adams	.....	21,745	21,745	24,000	4,000	None
Antelope	.....	25,000	25,000	None	20,000	None
Arthur	.....	......	......	None	......	None
Banner	2,758	572	3,330	None	4,000	None
Brown	5,000	5,000	10,000(a)	(b)	15,000	None
Butler	(c)	42,163	42,163	None	65,000	None
Cass	25,500	47,000	72,500	None	60,000	None
Cheyenne	8,074	4,660	12,734	None	16,000	None
Clay	3,980	15,400	19,380	None	20,000	None
Cuming	75,000	25,000	100,000	None	110,000	None
Custer	(c)	20,000	20,000	......	......	....
Douglas	55,701	91,100	146,801	None	150,000	2,000,000
Franklin	(c)	30,000	30,000	None	15,000	None
Frontier	8,000	18,000	26,000	None	23,000	None
Garfield	600	600	1,200	None	1,800	None
Hall	13,000	27,000	40,000	None	40,000	None
Harlan	6,624	16,561	23,185	None	......	None
Hayes	2,500	2,500	5,000	None	5,000	None
Howard	12,000	12,000	24,000	None	25,000	None
Jefferson	20,000	30,000	50,000	None	......	None
Keith	11,681	......	11,681	None	14,000	None
Lincoln	20,000	16,150	36,150	None	40,000	None
Madison	33,700	23,000	56,700	None	(d)	None
Merrick	.....	......	2,800	None	2,500	None
Nemaha	28,724	69,947(e)	98,671	None	......	None
Otoe	36,000	......	36,000	None	80,000	None
Platte	23,450	17,822	41,272	None	......	None
Polk	7,000	15,000	22,000	None	......	None
Redwillow	16,133	4,033	20,166	None	20,000	None
Richardson	10,000	55,000	65,000	None	......	None
Sarpy	19,000(a)	21,421	40,421(a)	None	40,000	None
Saunders	34,925	72,217	107,142	None	100,000	....
Seward	21,000	14,000	35,000	None	35,000	None
Sioux	3,000	7,000	10,000	None	10,000	None
Thayer	26,000	24,000	50,000	None	50,000	None
Webster	15,997	21,330	37,327	None	40,000	None
York	.....	30,000	30,000(a)	None	35,000	None

(a) Approximately; (b) Bonds were voted; (c) Roads are built by townships; (d) Amount cannot be determined until August, 1916; (e) Includes bridges built in 1914 and paid for in 1915.

HIGHWAY WORK BY COUNTIES IN NEVADA.

	1915 Work				1916 Work	
	Expenditures					
County.	Roads.	Bridges.	Total.	Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
Eureka	4,800	......	4,800	None	5,350	None
Lyon	11,626	2,244	13,870	None	21,000	None
Mineral	7,500	300	7,800	None	7,500	None
Nye	.....	......	1,864	......	......	....

NEW HAMPSHIRE

The total expenditures in New Hamphsire for state aid work, paid by the state and the towns jointly, during 1915, amounted to $562,690.27 for construction and $357,450.77 for maintenance.

The mileages of various kinds of roads built by state aid in New Hampshire during 1915 and to be built during 1916 are shown in the following table:

Kind of Road	Mileage built. 1915.	Mileage to be built. 1916.
Bituminous concrete (resurface)	....	2.0
Bituminous macadam	....	2.0
Graded road	3.0	....
Gravel	132.0	125.0
Water bound macadam	9.0	8.0

NEW JERSEY

The following tables prepared by the Department of Public Roads of New Jersey show the expenditures for state aid work in that state during 1915 and those proposed for 1916:

EXPENDITURES, 1915.

Amount paid from Public Road Fund (account of new construction)	$301,891.51	
Amount paid from Motor Vehicle Fund (account repairs and resurfacing)	754,066.01	
Convict labor appropriation	110,000.00	
Total amount paid by state		$1,165,957.52
Amount paid by counties (account of new construction)	$452,831.36	
Amount paid by counties (account repairs and resurfacing)	3,410,225.59	
Total amount paid by counties		$3,863,056.95
Total amount paid by state and counties (account new construction, repairs and resurfacing)		$5,029,014.47

EXPENDITURES, 1916.

Appropriation State Road Fund (account new construction)	$500,000.00	
Convict labor appropriation	90,000.00	
Motor Vehicle Fund—estimated (account repairs, resurfacing and Township Aid Act, Chap. 217, P. L. 1916)	1,200.000.00	
Total amount available for road work by state (in addition to surplus due on contracts entered in previous years)		$1,790,000.00
Amount to be paid from State Road Fund (account new construction)	$771,506.00	
Amount to be paid from convict labor appropriation	90,000.00	
Amount to be paid from Motor Vehicle Fund (account repairs, resurfacing and Township Aid Act)	1,200,000.00	
Total amount to be paid by state		$2,061,506.00
Amount to be paid by counties (account new construction)	$1,112,953.00	
Amount to be paid by counties (account repairs and resurfacing)	2,215,000.00	
Amount to be paid by townships (account Chap. 217, P. L. 1916)	105,000.00	
Total amount to be paid by counties and townships		$3,432,953.00
Total amount to be paid by state, counties and townships (account new construction, repairs, resurfacing and Township Aid Act).		$5,494,459.00

The mileages of different kinds of road built in 1915 and to be built in 1916 by state aid are shown in the following table:

Kind of Road	Mileage Built, 1915.	Mileage to be Built, 1916.
Bituminous concrete	8.260	12.369
Bituminous macadam	13.035	......
Brick	......	.183
Cement concrete (without bit. topping.)	.618	7.614
Cement concrete (with thin bit. topping)	1.166	1.160
Graded road	0.278	......
Gravel	10.455	69.677
Water bound macadam	19.117	60.145
Turnpike Purchase	......	6.770
Granite block	......	3.181
Totals	52.929	161.099

NEW MEXICO

According to a report from the State Engineer of New Mexico the total expenditures for road work in the state during 1915 amounted to about $405,259, of which $164,159 was expended by the state and the balance, $241,100, was expended by the counties. The probable expenditures for 1916 are shown in the following table furnished by the State Engineer:

To be Expended by State	Amount.	
State bond issue	$447,000	
1-mill levy	100,000	
Special county levy	29,467	
Automobile tax	21,000	
Delinquent tax	10,000	
Total		$607,467
To be Expended by Counties		
1-mill levy for roads and bridges	$235,000	
Levy for special bridges	95,000	
Forest Service Fund	15,893	
Camino Real fund (10 counties only)	13,305	
Luna County ¼ of bond issue	25,000	
Three-dollar road tax	40,000	
Delinquent tax	10,000	
Total		$434,198
Grand total		$1,041,665

The mileages of different kinds of road built during 1915, including only state work, are shown in the following table:

Kind of Road	Mileage Built in 1915.
Graded road	180
Gravel	47
Sand-clay	39
Miscellaneous	94
Total	[illegible]

NORTH CAROLINA

According to a recent report from the State Highway Commission the expenditures in North Carolina during 1915 were as follows:

Amount from special taxes	$1,800,000
Amount from bond issues	2,000,000
Other sources of revenue	80,000
Value of labor tax at $1.00 per day per man	800,000
Value of convict labor at $1.25 per day per man	150,000
Total	$4,830,000

The estimated funds available for work in 1916 are as follows:

Amount from special taxes	$2,500,000
Amount from bond issues	2,200,000
Other sources of revenue	100,000
Value of labor at $1.00 per day per man	800,000
Value of convict labor at $1.25 per day per man	180,000
Total	$5,780,000

The expenditures made by the state have amounted to $15,000, of which $10,000 comprised the annual appropriation for the State Highway Commission, and $5,000 the appropriation for the Highway Department of the State Geological and Economic Survey.

NORTH DAKOTA

According to a recent report from the State Engineer of North Dakota the total estimated expenditure for roads and bridges in 1915 was $2,400,000.

The mileages of different kinds of roads built during 1915 and to be built in 1916 are estimated as follows:

Kind of Road	Mileage Built, 1915.	Mileage to be Built, 1916.
Graded road	4,100.0	4,400.0
Gravel	80.0	200.0
Sand-clay	....	10.0
Total	4,184.0	4,610.0

The total of the available funds for road work in 1916 is about 2,711,000. Of this total about $1,475,000 is from the township road and bridge fund, about $550,000 is from the county bridge fund, about $615,000 is from the county road fund, and the balance is from the motor vehicle license fund.

OHIO

There was expended for road work by and under the supervision of the State Highway Department of Ohio during 1915 a total of $6,885,207.18. Of this total $5,733,268.89 was expended for road construction, 359.03 miles of road having been completed; $804,753.22 was expended for the maintenance of 905.06 miles of road; $207,285.34 was expended for bridge construction, and the balance was expended for administration. The total expenditure was about equally divided between state and local funds, the term "state funds" including all money from state appropriations, state taxes and other revenue, and the term "local funds" including money supplied by the local subdivisions, such as counties, districts, towns and townships.

The mileages of various kinds of pavement built under the contracts completed during the year are shown in the following table:

Kind of Pavement	Mileage.
Brick	117.20
Concrete	67.32
Water bound macadam	157.14
Bituminous macadam	2.53
Surface-treated macadam	10.40

In regard to 1916 work it is stated that it will be approximately the same in amount as that of 1915.

OKLAHOMA

The total expenditure on state roads in Oklahoma during 1915 was about $450,000, according to a recent report from the Department of Highways. It is stated that the state roads comprise from 10 to 15 per cent. of the total mileage of the state and that the expenditure on other roads probably amounted to about four times the expenditure on state roads, or $1,800,000.

It is estimated that the total expenditure on state roads during 1916 will amount to at least $600,000.

The mileages of various kinds of state roads built during 1915 are shown in the following table:

Kind of Road	Mileage Built in 1915
Plain macadam	6.7
Oiled macadam	3.0
Gravel	6.4
Sand-clay	89.0
Oiled earth roads	27.0
Earth roads	1,470.0
Miscellaneous	40.6

HIGHWAY WORK BY COUNTIES IN OKLAHOMA.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads	Bridges.	Total.			
Alfalfa	....	......	(f)	......	(f)	....
Caddo	3,000	2,000	5,000	None	......	None
Canadian	10,262	23,213	33,475	None	(g)	None
Choctaw	.....	......	......	......	13,000	....
Cimarron	.....	......	(a)	......	3,700	....
Delaware	.....	......	......	None	......	(b)
Dewey	.....	......	......	......	......	None
Grady	8,000	22,000	30,000	None	......	None
Harper	.....	......	7,272	None	16,000	None
Jefferson	20,000	9,200	29,200	None	30,000	None
Lincoln	70,000	67,000	137,000	None	140,000	None
McIntosh	7,319	3,334	10,653	None	4,000	100,000
Murray	30,000	30,000	60,000	37,500(c)	......	None
Nowata	.....	......	14,749	None	25,000	None
Pittsburg	.....	......	......	......	......	600,000
Pottawatomie	......	25,000	25,000	None	55,000(d)	None
Rogers	.....	......	......	219,000(c)	219,000	(b)
Texas	500	8,500	9,000	None	None	None
Tillman	.....	......	......	None	......	None
Washington	.....	......	......	None	83,500(e)	None
Washita	.....	......	7,000	None	20,000	None
Woodward	.....	......	7,191(e)	None	25,000	None

(a) New county, has spent very little to date; (b) Expect to vote bridge bonds; (c) Road bonds; (d) State furnishes convicts for work on roads, county feeding them; (e) Expended during year ending June 30, 1916; (f) Figures not available until close of fiscal year, June 30, 1916; (g) Estimate for 1916-1917 not yet made.

HIGHWAY WORK BY COUNTIES IN OREGON.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Benton	44,000	9,000	53,000	None	50,000	None
Clackamas	.....	......	28,370	None	232,000	None
Coos	.....	......	149,815	None	188,499	362,000(a)
Crook	23,014	5,986	29,000	None	......	None
Curry	18,000	18,000	36,000	None	......	35,000
Grant	21,458	1,493	22,951	None	32,500	None
Hood River	.....	......	45,000	None	45,000	None
Josephine	33,353	14,402	47,755	None	39,443	None
Lake	18,000	......	18,000	None	30,000	None
Lane	99,868	28,250	128,118	None	168,000	None
Lincoln	62,000	20,000	82,000	None	61,256	None
Marion	......	......	261,115(c)	None(d)	......	......
Morrow	30,000	6,500	36,500	None	30,000	None
Multnomah	.....	......	566,555	1,250,000(a)	631,029	None
Tillamook	175,000	5,000	180,000	None	174,000	None
Umatilla	100,819	19,000	119,819	None	120,000	980,000(a)
Union	30,000	10,000	40,000	None	20,000	None
Wasco	60,000	10,000	70,000	None	70,000	260,000
Wheeler	.....	......	19,000	None	20,000	None
Yamhill	72,000	8,000	80,000(b)	None	119,000	None

(a) Road bonds; (b) Approximate; (c) Total expenditures for roads, highways, bridges and ferries; $80,000 came from county fund; (d) General and special road taxes amounted to $160,851.

OREGON

No exact figures on the expenditure for road work in Oregon for 1915 are available. A recent statement from the Highway Department, however, placed the annual expenditure for roads in Oregon at something over $6,000,000. During the past year there has been considerable confusion in state highway work owing to the chaotic condition of the highway laws of the state, and while the present laws give the State Highway Department power to request information from the county authorities, it is found impossible to secure complete figures. It is stated, however, there is likelihood that a better plan of administering road affairs will be worked out at the next session of the Legislature.

Data on work in those counties from which reports have been received are shown in the table above.

PENNSYLVANIA

The expenditures made in Pennsylvania for work under the supervision of the State Highway Department are given in the following abstract of a statement received from the State Highway Department.

The Legislature of 1915 appropriated for all uses of the State Highway Department the sum of $8,300,000 for the two-year period from June 1, 1915, to June 1, 1917. Of this total appropriation $1,500,000 was for the repayment to the townships of their pro rata share of the cash tax bonus, the State Highway Department being merely the custodian of this sum. Of the balance, $500,000, or $250,000 a year, was appropriated for the state's share of the cost of state aid construction, and $250,000, or $125,000 a year, was appropriated for the purchase of toll roads. In addition, $50,000 was appropriated for the maintenance and repair of the Old National, or Cumberland Road. These specific appropriations left a balance of $6,000,000 or $3,000,000 a year, which was designated to the maintenance, construction and repair of state highways. As the state highway system of Pennsylvania comprises 10,200 miles, it can be seen that $3,000,000 amounts to less than $300 a mile annually, and this sum has been expended almost exclusively for maintenance. This explains the small mileage of roads constructed during 1915 and to be constructed during 1916.

The mileages of roads of different kinds built in Pennsylvania duirng 1915 are shown in the following table. All of these mileages except that of bituminous concrete were built under state highway contracts. It should be noted also that the milage given is that contracted for in 1915. Not all of it was completed.

Kind of Road	Mileage.
Bituminous concrete	6.63
Brick	3.73
Cement concrete without bituminous topping	.33
Water bound macadam	1.04

The following statement, furnished by the State Highway Department early in June, contains the available information on roads to be built during 1916:

> Two contracts are in force for state highway construction in Pennsylvania in 1916. These were awarded on May 18. Both are for reinforced cement concrete pavement, one 19,223 ft. in length and the other 10,344 ft. in length. These are sections of State Highway Route 131, familiarly known as the Old Baltimore Pike. The longer section is in Delaware County, the shorter one being in Chester County.
>
> Bids will be opened on June 13 for other sections of this highway. Sealed proposals have been asked for one section in Birmingham Township, Delaware County, to be 14,535 ft. in length, the type of construction being either reinforced cement concrete or bituminous and reinforced cement concrete. Another section of the same road is advertised in Chester County, Pennsbury and Kennett Townships, this section being 17,795 ft. in length and the type of pavement as above. The third section is in East Nottingham and West Nottingham Townships, Chester County, and is 21,035 ft. in length, the type of construction being the same as the other two sections. Another piece of highway construction will be in Rochester Township, Beaver County, and bids will be asked for 5,275 ft. of vitrified block.
>
> Two state aid contracts are being advertised, one in Nether Providence Township, Delaware County, for 4,250 ft. of vitrified block, and the other in Whitemarsh Township, Montgomery County, for 4,390 ft. of bituminous pavement.
>
> While it is likely that bids will be asked on other sections of state highway during the coming season, no announcement has been made by the State Highway Department to the present time of the character of the work which will be done on these highways.

RHODE ISLAND

During 1915 there was expended by the State Board of Public Roads of Rhode Island a total of $202,583.72. All of this, except $4,016.83 expended for bridges, was expended on the construction and maintenance of roads, largely on maintenance.

During 1915 3 miles of bituminous macadam roads were built by the State Board of Public Roads, and during 1916 21 miles of the same kind of roads are to be constructed. It is estimated that the total expenditure by the board during 1916 will amount to about $510,000 of which about $440,000 will be spent for roads and the balance for bridges.

SOUTH CAROLINA

There is no state highway department or other central authority having supervision over road work in South Carolina, and as the local authorities are not obliged to make returns of their expenditures to any state department, it is difficult to secure data on work done. Data on the work in those counties from which reports have been received are shown in one of the accompanying tables. Additional information on conditions in the state in general is given in the following statement furnished by the Department of Agriculture, Commerce and Industries:

> During the past year very considerable headway has been made in the matter of public highway construction in the State of South Carolina. The various county officials charged with the work seem to have gained a better understanding as to methods of construction of earth and sand-clay roads, and to have realized the value of top soiling clay roads. The result has been the construction during the year of many additional miles throughout the state of excellent earth and sand-clay roads, accompanied almost invariably by a most material increase in the width of the road. The Washington to Atlanta Highway, which is maintained under national supervision, running from Augusta, Ga., through Columbia to Cheraw, and thence north across the state, is now in excellent condition for travel at all seasons of the year and is thoroughly sign-posted by the state. Shortly this sign-posting will be supplemented by red, white and blue painted bands around every telegraph pole from one side of the state to the other.

HIGHWAY WORK BY COUNTIES IN SOUTH CAROLINA.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Aiken	36,187	1,225	37,412	None	7,000	40,000
Anderson	35,000	15,000	50,000	None	50,000	None
Berkeley	4,500	3,000	7,500	None	......	None
Calhoun	.....	......	11,000	None	11,000	None
Cherokee	40,000	7,000	47,000	None	59,000	None
Chesterfield	15,880	3,800	19,680	25,000	25,000	None
Colleton	.....	......	25,000	None	15,000	None
Darlington	.....	......	......	None	9,000	None
Florence	.....	......	22,302	None	20,000	None
Georgetown	.....	......	6,550	None	7,500	None
Kershaw	15,000	5,000	20,000	None	20,242	None
Marlboro	.....	......	25,000	None	30,000(a)	None
Saluda	3,000	2,000	5,000	None	......	None
Spartanburg	.....	......	......	None	85,000	None
Sumter	16,000	10,000	26,000	None	26,000	None

(a) Estimated.

> From Columbia to Charleston, by relocation for a distance of about 9 miles, one of the worst swamps that has interfered with travel for a century has been completely eliminated and an excellent road has supplanted the swamp road. This road will shortly be marked with blue and white bands, these colors being the state colors. During the year there was projected, and it is now nearing completion, the great Appalachian Highway running from Columbia via Newberry, Union, Spartanburg, on into the mountain region of North Carolina at Hendersonville and Asheville. Several of the counties in the state have voted bonds for permanent highway construction, the chief of these being Greenville County, where $960,000 of bonds will be issued for the construction of permanent highways.
>
> The State Department of Agriculture, Commerce and Industries which has heretofore been a pioneer in issuing detailed route books and highway maps, has in course of construction the most complete map ever issued, showing all of the principal highways in the entire state. As yet the state has no state highway commission, but it is very likely a commission will be provided for at the next session of the General Assembly.

SOUTH DAKOTA

Data on expenditures in 1915 in South Dakota are not available. Road and bridge levies for 1915 in organized townships amounted to $164,768 and in organized counties to $1,270,579.

For 1916 there is available for roads and bridges a total of $2,707,806.

TENNESSEE

Since the printing of the last review of road work, a state highway department has been established in Tennessee. The following statement by the department contains the available information on the work during 1915 and that proposed for 1916:

The Tennessee Department of Highways was organized in August, 1915, and while the law creating the department is far from what might be desired, officials of the department have construed the law liberally and are seeking to extend the work of the department to cover many features not specifically provided for in the law. This has been particularly true in the matter of selling county road bonds, the state department taking general supervision over this work. When the department was organized county road bonds were selling at and below par. Since the state has taken a hand in this work no bonds have sold below par and none have failed to bring a premium, one issue of $350,000 in Franklin County selling for 107¼.

Tennessee has approximately 45,000 miles of public roads with about 8,000 improved, about 8,000 graded and drained and about 2,000 now under construction. This work has all been done by the counties and largely through bond issues. About $6,000,000 was spent in the state during 1915 for construction, mostly from bond issues. During 1916 about $8,000,000 is being expended from bond issues for construction; and approximately $5,000,000, from direct county taxes, on maintenance of all classes of roads. By state supervision of bond issues the department officials estimate that they have saved the counties selling bonds approximately $60,000 during the time the department has been in existence.

The State Department of Highways is entrusted with the expenditure of the automobile license fund which will approximate this year $150,000. Ten per cent. of this is reserved for maintenance of the state department and the remaining 90 per cent. goes back to the county from which collected for maintenance of designated state highways. No funds are provided for construction work by the department.

While department officials have not been able to cover the entire state they have inspected, accepted and designated as state highways approximately 4,000 miles of roads, and a number of these have been taken over by the state for maintenance. Others will be taken over as soon as they are brought up to standard. The system of state highways includes all highways connecting county seats, the plan of the department being to connect all county seats in the state by good roads and then start the work of building the lateral roads.

Although the law does not permit the department to construct roads, the department is laying plans for a better system of maintenance. * * * Maintenance patrols have been established in several counties * * *

Due to the short time the department has been organized and the small funds provided for its operation but little has been done in gathering statistics, and few counties will be able to furnish any until the end of the year. A system of accounting has been provided and an effort is being made to have each county adopt this system. However, all counties are required to furnish the state department monthly reports showing the amount expended on the state highways in each county, the class of work being done and the mileage of each class. This applies also to the cost of repairing and maintaining state highways.

In every county thus far the department has been able to secure special appropriations or private donations equal to the amount provided by the state, which will mean that instead of the state having $150,000 to spend on state highway maintenance it will have about $300,000, all of which is spent under the supervision and direction of the state department. In addition to this the counties will spend large sums on these roads through the regular county sources. In spending the state aid funds the department is endeavoring to take over certain blocks of road and to not only maintain the section but to use it as an example for the county to follow, thus attempting to educate all county road officials in modern methods of road maintenance. It is hoped that in this way also the state will aid the counties in saving large sums.

Briefly stated, Tennessee spent during 1915 approximately $6,000,000 in new construction and $5,000,000 in maintenance and repairs. During 1916 Tennessee will spend under state supervision approximately $300,000, $8,000,000 in new construction and $5,000,000 in repair and maintenance.

TEXAS

All road work of Texas is performed by local authorities, there being no state highway department or other central authority in charge of road work. No returns have to be made by the local officials to any central authority and for that reason complete data on work done are not available. Many of the counties are very active, and data on work done in those from which reports have been secured are shown in one of the accompanying tables.

According to information received from the Texas Good Roads Association, something over $14,000,000 was raised for road improvement in Texas during 1915. It is stated that most of this money is being used for the construction of gravel roads. There is also a small amount of sand-clay construction, and approximately $1,000,000 has been used for bituminous gravel roads. It is further stated that probably $20,000,000 will be raised for road work during 1916, and that up to the present the amount raised is proportionately larger than this sum. It is also expected that at the session of the Legislature in January, 1917, laws will be passed providing for state supervision of road work. In the meantime an engineer from the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture has been detailed to cooperate with the local authorities under the direct supervision of the Governor.

UTAH

During 1915 the expenditure for work done under the supervision of the State Highway Department was $463,100. Of this amount $257,500 was expended for road construction, $67,400 for the construction of bridges and culverts, $39,900 for the maintenance of roads and bridges, $36,400 for engineering and administration, and the balance was expended for machinery, equipment, and miscellaneous items. The total of $463,100 consisted of $121,000 of state funds and $342,100 of local funds.

The work in 1915 included the grading of 267 miles of road, the surfacing of 127 miles, the construction of 400 culverts and the building of 36 bridges, of which 24 were concrete.

It is estimated that the total expenditure during 1916 for work under the supervision of the State Road Commission will amount to about $750,000.

Data on the expenditures in those counties from which reports have been received are shown in one of the accompanying tables.

HIGHWAY WORK BY COUNTIES IN UTAH.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Carbon	.....	......	35,535	31,000(a)	......	None
Duchesne	4,000	1,000	5,000	None	5,000	None
Juab	9,000	1,000	10,000	None	12,000	None
Sevier	.....	......	4,500	None	......	None
Tooele	.....	......	24,673(a)	......	......	....
Wasatch	.....	......	11,000	None	12,000	None

(a) Between July 1, 1914, and June 30, 1915, fiscal year, $24,673 was expended on roads and bridges in Tooele County, and same amount will be expended for fiscal year following.

VERMONT

The following statement from the State Highway Department contains the available data on road expenditures in Vermont during 1915:

EXPENDITURES FOR STATE ROADS IN 1915.

Construction.

Expended by the state in towns	$323,759.72	
Expended by the towns	126,885.62	
		$450,645.34
Expended by the state in cities and villages	11,754.15	
Expended by cities and villages	62,990.56	
		74,744.71
		$525,390.05

Note:—There was much other work in cities and villages that is not reported to this office, as only that work is reported that is subject to revision of this department.

Maintenance.

Expended by the state in towns	$118,535.57	
Expended by the towns	134,318.74	
		$252,854.31
Expended by the state in cities and villages	12,000.95	
Expended by the cities and villages	22,494.02	
		34,494.97
		$287,349.28

The probable expenditure in 1916 is covered by the following statement from the Department:

The road expenditures of 1916 will be about the same as those in 1915, except that we expect to expend some $250,000 or more of state money upon maintenance of state roads, in addition to the amount expended by the towns against it. In other words, the state will expend some $250,000 and the towns some $175,000 (estimated).

The mileages of different kinds of roads built in Vermont during 1915 are shown in the accompanying table. The table covers only work upon the state road system upon which state money is expended. The mileages to be built in 1916 will, it is estimated, be greater than those built in 1915.

Kind of Road	Mileage Built
Bituminous macadam	4.14
Gravel-telford	23.84
Gravel	161.53

VIRGINIA

According to information furnished by the State Highway Commission of Virginia, the total expenditure by the Commission for road and bridge work during the period from October 1, 1914, to October 1, 1915, was $2,209,384, of which $1,399,514.04 was expended for roads built by state aid money, county and bond issue funds, including small bridges and culverts. Of the balance, $112,682.15 was expended for the construction of bridges, and $638,770.57 was expended for roads built by convict labor. The balance was expended for administration.

The total expenditure for roads and bridges in 1916 is estimated at $2,200,000.

The mileages of various kinds of road built under the supervision of the State Highway Department by convict labor and state aid, and by bond issues and county funds, etc., during 1915 are shown in the following table:

Kind of Road	Mileages.
Bituminous concrete	1.72
Bituminous macadam	18.16
" " (previously graded)	1.65
Graded road	152.32
Gravel	110.33
Water bound macadam	158.26
" " " (previously graded)	30.22
Sand-clay and soil	366.09
Shell	4.51
Shale	3.29

HIGHWAY WORK BY COUNTIES IN WISCONSIN.

County.	1915 Work				1916 Work	
	Expenditures			Total amount of bonds voted.	Total amount available for roads and bridges.	Total amount of bonds voted and to be voted.
	Roads.	Bridges.	Total.			
Ashland	31,000	1,000	32,000	None	27,000	None
Barron	31,804	4,191	35,995	None	28,542	None
Bayfield	26,000	9,000	35,000	None	34,000	None
Brown	138,000	23,000	161,000	......	102,000(a)	650,000(b)
Buffalo	19,672	4,050	23,722	None	25,623	None
Clark	43,411	12,808	56,219	None	51,773	None
Dane	230,254	11,275	241,529	None	250,000	None
Dodge	96,000	......	96,000	None	94,416	None
Douglas	55,882	9,038	64,920	75,000	88,372	None
Eau Claire	9,000	1,000	10,000	None	40,000	None
Florence	13,500	......	13,500	None	20,000	None
Forest	54,953	2,541	57,494	9,000	75,000	30,000
Grant	101,000	7,000	108,000	None	90,000	None
Green Lake	4,000	16,000	20,000	None	27,667	None
Iowa	36,343(c)	429	36,772	None	40,000(d)	None
Iron	42,000	3,000	45,000	None	60,000	(b)
Jefferson	75,000	5,000	80,000	None	80,000	None
Juneau	54,145	2,825	56,970	None	42,092	....
La Crosse	102,962	27,000	129,962	None	160,000	None
Marathon	42,227	13,144	55,371	None	69,242	None
Marinette	53,000	2,000	55,000	None	57,000	None
Milwaukee	765,727	21,912	787,639	None	513,000	None
Monroe	66,000	3,850	69,850	None	65,000	None
Oneida	59,000	10,000	69,000	21,500	60,000	....
Outagamie	39,000	5,000	44,000	None	300,000	700,000
Ozaukee	12,300	6,700	19,000	None	21,000	None
Pierce	23,250	7,750	31,000	None	39,000	....
Polk	31,683	5,181	36,864	None	58,000	....
Portage	.....	......	......	16,000	......	20,000
Price	.....	......	31,000	None	38,000	....
Richland	46,772	55,228	102,000	None	70,000(e)	None
Rock	128,000	12,000	140,000	None	140,000	None
Sauk	.....	......	133,502	None	120,000	20,000
Shawano	34,734	1,768	36,502	None	40,000(c)	None
Trempealeau	75,000	40,000	115,000	None	125,000	4,000(b)
Washburn	17,000	4,000	21,000	8,000	30,000	....
Winnebago	.....	......	35,930	10,000	62,206	....
Wood	69,317	10,413	79,730(c)	None	54,002(c)	....

(a) Outside of bond issue; (b) For roads; (c) State aid; (d) Approximately; (e) Estimate of total for years exclusive of township work.

WASHINGTON

According to a report from the State Highway Commissioner of Washington, the expenditures for road work in the state during 1915 including both state highways and permanent highways were as follows:

Road and bridge construction	$2,258,337.33
Maintenance of roads and bridges	273,729.19
Engineering	101,021.13
Administration	37,614.85

The mileages of permanent highways and state roads built from public highway funds in Washington during 1915 are shown in the following table:

Kind of Road	Mileage Built 1915
Bituminous concrete	1.50
Bituminous macadam	19.55
Brick	3.60
Cement concrete (without bituminous topping)	14.41
Graded road	190.75
Gravel	234.79
Water bound macadam	24.16

The total mileage to be built in 1916 will probably be about the same as that built in 1915. The total expenditure will probably be about $2,800,000.

WEST VIRGINIA

While exact data on the expenditures for road work in West Virginia during 1915 are not available, it is estimated that the county funds obtained from levies during that year amounted to about $2,000,000. In addition, there was available from bond issues approximately $2,000,000 more, making a total of $4,000,000.

At the beginning of the current year it was estimated that the total county funds from levies would amount to about $2,000,000, and that in addition there would be available from bond issues about $8,000,000, making a total of $10,000,000. A part of this, however, will probably be carried over to 1917 for work during that year.

WISCONSIN

Official figures on the expenditure for road work in Wisconsin in 1915 and on the proposed expenditures for the current year are not obtainable at this time. It is probable, however, that the total expenditure in the state in 1915 amounted to about $4,500,000, and that the expenditure in 1916 will at least equal this figure.

The mileages of state aid roads built in 1915 and to be built in 1916 are shown in the following table:

Kind of Road	Mileage Built 1915	Mileage to be Built 1916
Bituminous concrete	.60	....
Bituminous macadam	5.52	....
Cement concrete (without bituminous topping)	66.00	85.00
Graded road, not surfaced	497.00	500.00
Gravel, pit run	181.00	180.00
Water bound macadam	387.00	390.00
Sand-clay	83.00	80.00
Miscellaneous	61.29	60.00

It should be noted that the figures for 1915 work were compiled before returns had been received from all of the counties in the state, and that the figures for the mileages to be built in 1916 were estimated from the 1915 mileages and the sums available for this year's work.

WYOMING

During 1915 the total expenditure for the construction and maintenance of roads and bridges in Wyoming amounted to about $436,300.

The total amount appropriated by the various counties for expenditure on roads and bridges during 1916 is about $304,720. According to the State Engineer, while this amount is considerably less than the expenditure in 1915, it is quite probable that the expenditures of the previous year will be equalled, if not exceeded.

British Usage in the Nomenclature of Bituminous Road Materials*

The materials now used by road engineers for binding together the stones and other mineral aggregate used to form road crusts and road surfaces may be conveniently divided into three groups. These are:

1. The tars and pitches obtained by the destructive distillation of coal or similar substances.
2. The bitumens and asphalts which are found in nature, or are obtained artificially from asphaltic oils.
3. Chemical binders, including the Portland and natural cements which owe their cementing value as road binders to chemical action, and which are not dealt with in the present report.

Hitherto the term "bituminous material" has been loosely applied to tar products as well as to bitumens and asphalts, but the committee have from the first considered that it was desirable from the road engineers' point of view to maintain a sharp line of demarcation between the two groups. The views put forward in correspondence from America and by American engineers of standing and experience have been carefully considered, but the committee still adhere strongly to the view that the description "bituminous" should be applied only to the second group.

In accordance with this view the committee consider that it is desirable to make a sharp distinction between coal tar and paraffin oil derivatives on the one side, and native bituminous substances and asphaltic oil residue on the other, and they are therefore unable to accept the American definition of bitumen which would include the coal tars.

Definitions

First Group: Tar Products (Principally Coal Tar and Pitch)

1. Definition of Tar.—Tar is the matter (freed from water) condensed from the volatile products of the destructive distillation of hydrocarbon matter, whether this be contained in coal, wood, peat, oil, etc.

2. Prefix Denoting Source of Origin or Method of Production.—A prefix such as "coal," "wood," "peat," "gas works," "blast furnace," "coke oven," etc., must be added to the word "tar" to indicate the source of origin or method of production.

3. Definition of Pitch.—Pitch is the solid or semi-solid residue from the partial evaporation of tar.

Second Group: Bitumens and Asphalts

4. Definition of Bitumen.—Bitumen is a generic term for a group of hydrocarbon products soluble in carbon disulphide, which either occur in nature or are obtained by the evaporation of asphaltic oils. The term shall not include residues from paraffin oils or coal tar products.

Note—Commercial materials may be described as bitumen if they contain not less than 98 per cent. of pure bitumen as defined above.

5. Definition of Native Bitumen.—Native bitumen is bitumen found in nature, carrying in suspension a variable proportion of mineral matter.

The term "native bitumen" shall not be applied to the residuals from the distallation of asphaltic oils.

6. Definition of Asphalt.—Asphalt is a road material consisting of a mixture of bitumen and finely graded mineral matter. The mineral matter may range from an impalpable powder up to material of such a size as will pass through a sieve having square holes of ¼-in. side.

7. Definition of Native or Rock Asphalt.—Native or rock asphalt is a rock which has been impregnated by nature with bitumen.

8. Prefixes Denoting Source of Origin.—The committee recommend that for convenience of identification prefixes denoting geographically the source of origin should be attached to each of the four terms defined above.

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*Extracts from Report No. 76 of the British Engineering Standards Committee.

In Providing for Shade Trees Along Public Highways New York State has been Backward as compared with some other states, it is asserted in a recent bulletin of the New York State College of Forestry at Syracuse University. It is pointed out that although in some New York cities shade tree commissions with trained arboriculturists as executive officers are being appointed, greater progress along this line is being made in Massachusetts, New Jersey and Pennsylvania. The improvement of streets along strictly utilitarian lines, according to the bulletin, has been the subject of much study, but the planting of shade trees along streets and roads is a form of improvement that, although of incalculable value, has received comparatively little attention from a municipal standpoint. The result of this is that a great area in the public highways of New York has been planted in a haphazard manner.

TABLE 1.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS

(Continued from page 14).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916. Kind	Laid to Jan. 1, 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Kind	Laid and to be laid during 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Estimated cost, including foundation but not grading
Massachusetts (Continued):					
Springfield	SA	.41 (m)	SA	808	1,212
	AB	.04 (m)	BC	56,009	58,546
	BI	2.23 (m)	BM	155,571	90,281
	BC	6.18 (m)	B	10,032	26,335
	BM	26.10 (m)	C	287	359
	B	3.54 (m)	CT	21,228	26,535
	C	2.49 (m)	M	4,110	5,137
	CT	1.67 (m)	SB	12,270	37,615
	G	49.71 (m)	WB	2,906	8,984
	M	58.56 (m)			
	SB	3.15 (m)			
	WB	5.68 (m)			
	RM	.17 (m)			
	MI	2.15 (m)			
Stoneham	BM	35,000	BM	13,000	13,000
	G	380,000			
	M	18,000			
Swampscott * *	C	3,920	....	.....	....
Walpole	....	None	....	None	....
Waltham	BM	37,755	....	.....	....
	B	2,807			
	G	201,848			
	M	527,883			
	SB	27,877			
	WB	1,922			
Watertown	SA	3,500	?	450,000	....
	BM	321,098			
	G	110,049			
	M	98,123			
	HA	1,600			
Webster	BM	5,542	....	None	....
Westborough	M	4,000 (f)	M	4,000 (f)	....
Westfield	SA	8,211	....	No new work probable	....
	BC	9,423			
	BM	143,182			
	B	1,212			
	SB	29,363			
Westford	....	(2)	....	None	....
W. Springfield†	....	......	BI	6,870	....
Whitinsville*	B	None	B	None	....
Winchester*	B	None	B	None	....
Woburn	....	......	BM	12,000	15,000
Worcester	SA	21,392	....	.....	....
	BI	898			
	BM	247,605			
	B	12,418			
	C	25,532			
	CT	17,252			
	G	581,620			
	M	1,283,796			
	SB	361,601			
	WB	3,818			
Michigan:					
Allegan * *	C	30,222	....	.....	....
Alma * *	C	4,200	....	.....	....
Alpena * *	C	29,521	....	.....	....
Ann Arbor	AB	32,494	B	12,000	20,000
	BI	7,519			
	BC	19,297			
	B	27,206			
	C	5,358			
	CT	139,361			
Battle Creek	BC	56,583	BC	60,000	81,000
	B	304,296	B	8,000	12,000
Bay City	SA	187,080	....	None	....
	BI	3,360			
	B	318,570			
	C	20,460			
	M	900			
Michigan (Continued):					
Marshall	SA	1.18 (m)	U	5,130	....
	BC	.95 (m)			
	B	.41 (m)			
	CT	.53 (m)			
	G	1.90 (m)			
	M	.33 (m)			
Marquette	?	33 (m)	BM	15,000	....
Menominee * *	C	6,352	....	.....	....
Monroe	AB	6,292	C	2,500	3,500 (g)
	B	44,792	WB	350	1,000
	C	59,914			
	WB	500			
Mt. Pleasant **	C	17,912	....	.....	....
Negaunee	BM	28,000	BM	15,000	16,500
Niles * *	C	1,795	....	.....	....
Petoskey *	B	None	B	None	....
Petoskey * *	C	8,205	....	.....	....
Pontiac * *	C	17,131	....	.....	....
Port Huron	....	......	B	5,000	9,500
			C	4,000	1,600
Saginaw	?	75.00 (m)	SA	30,000	63,000
St. Clair	....	......	C	6,280	....
St. Johns *	B	22,000	....	.....	....
St. Johns * *	C	15,888	....	.....	....
St. Joseph * *	C	160	....	.....	....
Sault Ste. Marie	BI	25,000	BC	20,000	51,500 (t)
	BM	14,000	C	5,000	
	WB	600	WB	1,500	
South Haven * *	C	1,075	....	.....	....
Sturgis	B	50,000	C	1,500	1,500
Three Rivers * *	C	12,733	....	.....	....
Traverse City	BI	21,560	....	None	....
	BM	31,370			
	B	71,000			
Wyandotte * *	C	77,524	....	.....	....
Ypsilanti * *	C	8,118	....	.....	....
Minnesota:					
Albert Lea	B	4,700	....	Not decided	....
	C	675			
	SB	6,505			
	WB	99,591			
	G	11.00 (m)			
Austin * *	C	711	....	.....	....
Brainerd * *	C	43,750	....	.....	....
Chisholm	C	14,445	C	16,300	27,500
	WB	39,560			
Cloquet	RM	18,000	....	(Indef.)	....
Grookston *	B	None	....	.....	....
Duluth	SA	4.50 (m)	SA	17,000	50,000
	BI	.40 (m)	B	60,000	160,000
	BM	9.50 (m)	C	15,000	30,000
	B	5.10 (m)	M	6,000	12,000
	C	10.60 (m)	SB	3,000	6,900
	G	62.90 (m)			
	M	36.70 (m)			
	SB	5.90 (m)			
	WB	1.50 (m)			
	MI	1.90 (m)			
Eveleth *	B	None	....	.....	....
Eveleth †	....	......	BI	20,000	....
Fairmont	C	573	BM	20,000	42,000
	WB	23,000	WB	15,000	36,000
Faribault	B	21,567	....	None	....
	C	980			
	SB	3,798			
	WB	16,475			
Hastings	....	None	....	None contemplated	....
Hibbing	BI	36,420	BI	4,500	12,060
	WB	81,245			

Michigan (Continued):					
Belding	....	......	B	18,000	42,000
Big Rapids	G	12,000	G	3.00 (m)	6,000
	M	19,000			
Boyne	....	......	C	12,000	15,000
			M	28,160	14,000
Cadillac	BI	18,000	B	2,600	4,500
	B	8,600	C	25,000	30,000
	C	23,000	M	6,000	3,000
	G	50,000			
	M	100,000			
Caro * *	C	17,252	....	.....	....
Charlevoix * *	C	24,500	....	.....	....
Charlotte * *	C	18,050	....	.....	....
Coldwater	B	2.000 (m)	B	7,000	12,800
	C	0.250 (m)	CT	4,400	5,300
	CT	0.375 (m)			
Crystal Falls *	B	None	B	None	....
Detroit	SA	2,569,965	....	Data not available	....
	AB	18,569			
	BM	5,251			
	B	2,179,692			
	C	430,889			
	CT	664,763			
	M	26,348			
	SB	182,440			
	WB	3,093,535			
Dowagiac * *	C	16,667	....	.....	....
	CT	9,300			
Escanaba * *	C	40,000	....	.....	....
Fenton	....	None	C	12,000	15,000
Flint	SA	114,241	SA	114,620	230,372
	AB	17,249	AB	735	2,096
	B	267,817	B	9,715	22,344
	C	19,381			
	WB	15,358			
Grand Haven	BC	4,820	....	10 000	15,000 (t)
	B	9,640			
	C	18,060			
Grand Rapids	SA	153,331	....	.....	....
	AB	39,232			
	BC	126,555			
	BM	8,599			
	B	902,237			
	C	26,513			
	G	2,659,325			
	M	122,659			
	WB	8,348			
Greenville * *	C	5,024	....	.....	....
Hancock	SA	8,155	M	10,000	....
	BI	10,310			
	C	7,280			
	M	15,000			
	MI	9,900			
Hillsdale	....	......	..?	14,000	....
Holland	G	2.00 (m)	....	.....	....
	M	1.00 (m)			
Ironwood *	B	None	B	None	....
Jackson * *	C	35,228	....	.....	....
Kalamazoo	SA	71,153	BC	25,000	100,000 (t)
	AB	19,120	B	15,000	
	BI	20,133			
	BC	161,870			
	BM	2,711			
	B	270,370			
	C	14,167			
Lansing * *	C	13,776	....	.....	....
	CT	19,267			
Laurium *	B	None	B	None	....
Laurium * *	C	15,170	....	.....	....
Manistee	BC	4,155	....	.....	....
Marine City	....	......	....	None	....
Minnesota (Continued):					
Mankato	SA	18,526	....	.....	....
	B	50,307			
	C	29,728			
	M	6,196			
	WB	56,196			
Minneapolis	SA BC	247,259	BC	59,000	60,000
	BM	357,767	B	26,500	59,000
	B	438,013	C	6,000	8,000
	C	198,908	SB	10,400	23,000
	SB	805,765	WB	290,000	745,000
	WB	1,630,951			
Moorhead * *	C	7,720	....	.....	....
New Ulm	WB	15,205	....	.....	....
Pipestone	C	32 (b)	C	30 (b)	....
Red Wing	B	3,999	....	None	....
	C	1,425			
	SB	3,785			
	WB	24,993			
	G	2.00 (m)			
Rochester	BC	58,999	....	.....	....
	B	28,324			
	CT	7,182			
	WB	74,438			
St. Cloud	BM	1,827	BI	16,702	36,000
	C	25,121	WB	36,513	87,700
	M	20,486			
St. Paul	SA	9,910	BC	106,104	165,105
	BC	15,592	B	9,903	28,630
	B	6,464	C	1,800	3,000
	C	9,775	WB	104,183	270,480
	SB	14,413			
	WB	119,910			
South St. Paul	G	60,000	WB	35,000	100,000
	SB	25,000			
Stillwater	B	9,672	....	(Indef.)	....
	C	4,774			
	SB	3,070			
	M	1.00 (m)			
Two Harbors	C	9,800	C	2,576	3,934
	M	39,381	Additional work may be done		
Virginia	BI	79,969	....	(Indef.)	....
	B	504			
	C	6,172			
	WB	140,374			
	G	5.00 (m)			
	M	2.25 (m)			
Wilimar	....	None	....	None	....
Mississippi:					
Biloxi	B	1.00 (m)	....	None	....
	MI	30.00 (m)			
Columbus * *	C	3,728	....	.....	....
Greenville	B	1.50 (m)	....	None	....
Grenada	?	20.00 (m)	WB	11,000	35,000
Hattiesburg	BI	30,130	?	?	?
	B	23,950			
	G	100,000			
	MI	69,300			
Jackson * *	C	8,505	....	.....	....
McComb City	....	None	....	None	....
Meridian	BI	74,665	....	None proposed	....
	B	50,000			
	C	31,238			
	G	27,929			
	M	40,000			
	WB	18,500			
Tupelo * *	C	2,500	....	.....	....
Vicksburg	?	9.00 (m)	?	22,000	34,000 (t)
Missouri:					
Aurora	....	None	....	.....	....
Booneville * *	C	24,598	....	.....	....
Brookfield	B	27,455	....	(Indef.)	....
Cameron * *	C	28,836	....	.....	....
Cape Girardeau * *	C	155,846	....	.....	....
Carrollton	B	4.0 (m)	....	None	....
	C	0.5 (m)			
	M	1.0 (m)			

Symbols for Different Kinds of Paving.—SA, sheet asphalt; AB, asphalt block; BI, bitulithic; BC, bituminous concrete; BM, bituminous macadam; B, brick; C, cement concrete without bituminous topping; CT, cement concrete with bituminous topping; G, gravel; M, water bound macadam; WB, wood block; SB, stone block; AM, Amiesite; WA, Warrenite; HA, Hassam; SC, sand-clay; RM, rocmac; U, kind not definitely decided upon; MI, miscellaneous—not included in foregoing classification.

TABLE I.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Missouri (Continued):					
Caruthersville	....	None	BC	12,000	16,300
Chillicothe	B	50,697	CT	5,000	64,000 (t)
	CT	8,035	B	30,000	
Clinton * *	C	11,773	....	.....	....
Columbia	BM	8,384	BM	12,365	17,960
	B	253,277			
	C	27,324			
	CT	3,706			
	MI	38,156			
Eldorado Springs * *	C	15,000	....	.....	....
Hannibal *	....	......	B	2,500	2.07 (s)
Hannibal * *	C	26,589	....	.....	....
	CT	8,200			
Hayti *	B	None	B	6,000	....
Independence	SA	38,447	....	30,000	42,000 (t)
	BI	16,883			
	BC	14,670			
	B	53,571			
	C	73,895			
	M	98,551			
	MI	22,460			
Jefferson	BM	250,000	BM	25,000	22,500
	B	40,000	B	11,000	13,200
	C	2,000	C	2,000	2,000
Joplin *	B	83,000	B	37,000	1.50 (s)
Joplin * *	C	10,427	....	.....	....
Kansas City	AB	72,580	....	.....	....
	BM	6,770			
	B	18,920			
	C	307,640			
	SB	14,440			
	WB	23,360			
Kirksville	BI	20,000	B	15,000	2.00 (s)
	B	53,000			
	C	33,000			
Liberty	BM	.25 (m)	C	5,000	7,500 (t)
	B	1.00 (m)			
	C	4.50 (m)			
Louisiana	G	10.00 (m)	?	10,000	1.00 (s)
Marshall * *	C	60,778	....	.....	....
	CT	13,380			
Mexico * *	C	6,500	....	.....	....
Nevada * *	CT	49,000	....	.....	....
Poplar Bluff * *	C	2,850	....	.....	....
	CT	10,000			
St. Charles	BM	4,864	....	.....	....
	B	46,564			
	M	200,000			
St. Joseph * *	C	236,080	....	.....	....
St. Louis	SA	1,867,340	SA	89,800	175,100
	BI	1,170,528	B	110,300	198,540
	B	4,390,336	WB	41,920	25,122
	WB	383,579			
	MI	1,615,428			
Sedalia	SA	91,375	B	15,000	26,000
	B	262,000	C	10,000	12,500
	C	2,500			
	CT	7,000			
Slater	B	7,200	....	.....(21)	....
Springfield * *	C	300,702	....	.....	....
Trenton * *	C	7,478	....	.....	....
Warrensburg	B	98,450	B	1,200	....
Webb City *	B	48,143	B	None	....
Webster Groves * *	C	15,000	....	.....	....
	CT	30,000			
Montana:					
Anaconda	BC	35,202	BC	19,500	39,000
	M	15,000			
Billings	BI	64,960	U	10,000	18,500
	B	32,505			
	C	12,415			
New Hampshire (Continued):					
Manchester †	....	......	BI	10,000	....
Nashua * *	C	22,510	....	.....	....
	CT	2,000			
Peterborough	BM	1,800	BM	4,600	....
	G	2,000			
	M	24,400			
Portsmouth *	B	11,000	B	None	....
Rochester	SA	5,000	C	5,000	4,300 (t)
	BC	8,000			
	BM	85,000			
	G	40,000			
	M	250,000			
	SB	20,000			
New Jersey:					
Atlantic City	SA	14.70 (m)	....	.....	....
	BI	10.70 (m)			
	B	8.50 (m)			
	G	19.80 (m)			
	M	12.30 (m)			
	WB	1.60 (m)			
	WA	.60 (m)			
Asbury Park * *	C	615	....	.....	....
Bayonne	SA	383,000	SA	60,000	120,000
	BI	97,000	BC	16,000	24,000
	BM	7,000	SB	17,000	51,000
	B	57,000			
	C	7,000			
	M	71,000			
	SB	58,000			
	WB	900			
Belleville †	....	......	BI	55,516	....
Bloomfield *	B	None	B	None	....
Bloomfield * *	C	300	....	.....	....
Boonton	SA	.50 (m)	....	.....	....
	B	.50 (m)			
	G	20.00 (m)	....	.....	....
Bound Brook	....	......	B	(Indef.)	....
Bridgeton * *	C	1,400	....	.....	....
Burlington	B	6,000	....	None	....
Camden	?	84.5 (m)	SB	10,000	2.90 (sg)
Chester	G	3,000	G	20,000	4,000
	M	11,000	M	7,000	6,000
	MI	6,600	MI	15,000	2,500
Dover *	B	None	....	.....	....
East Orange	AB	2.39 (m)	AB	0.34 (m)	....
	BI	5.91 (m)	M	0.36 (m)	....
	BC	2.03 (m)			
	CT	.65 (m)			
	M	50.72 (m)			
	SB	.26 (m)			
	MI	2.06 (m)			
Elizabeth	SA	4.60 (m)	SA	1.00 (m)	400,000 (t)
	BC	3.50 (m)	BC	3.00 (m)	
	B	9.50 (m)	SB	1.00 (m)	
	SB	30.50 (m)			
	MI	17.20 (m)			
Garfield	BM	78,697	BM	9,000	9,000
	B	9,722	SB	12,507	43,775
	SB	13,683			
Glen Ridge	M	14.00 (m)	C	1,200	1.25 (sg)
Hammonton * *	C	3,345	....	.....	....
Harrison †	....	......	BI	14,796	....
Irvington	?	15.00 (m)	....	(Indef.)	....
Jersey City	SA	2,974	....	.....	....
	AB	2,616			
	B	19,027			
	SB	42,670			
Keyport * *	C	7,620	....	.....	....
Lakewood	BM	1.00 (m)	C or CT	15,000	30,000
	G	20.00 (m)			
	M	8.00 (m)			

Montana (Continued):					
Bozeman	BI	144,000	BI	50,000	98,500
	C	28,000			
Butte	C	823	U	21,500	75,000
	WB	11,558		(Other work contemplated)	
Great Falls	BI	167,154	BI	36,450	....
	C	18,620	C	3,120	....
	G	19,000			
	M	11,300			
	WB	67,250			
Helena	B	27,400	B	5,600	20,000
	M	36,850			
Livingston	BI	22,583	BI	5,400	....
			U	40,000	....
Missoula	BI	61,247	BI	5,840	20,000 (t)
	B	35,032			
	C	5,436			
	WB	6,029			
Nebraska:					
Beatrice * *	C	1,300	....	.....	....
Benson	B	2,500	....	(Indef.)	....
	C	7,200			
	SB	5,600 (f)			
Columbus †	....	......	BI	45,704	....
Falls City	B	73,000	B	8,000	16,500
Fremont	B	124,560	C	30,000	120,500 (t)
			U	28,000	
Grand Island	B	132,000	....	(Indef.)	....
	C	4,700			
	MI	8,000			
Hastings	SA	41,422	SA	175,000	300,000 (g)
	B	76,341			
	SB	2,800			
Kearney	BC	26,200	SA	36,000	1.40 (s)
	B	22,470	BC	22,000	1.30 (s)
	C	9,170	B	14,000	1.64 (s)
Lincoln	SA	21.36 (m)	SA	25,000	375,000?
	BI	14.71 (m)	B	45,000	
	B	25.28 (m)	BI	78,999	
	C	1.20 (m)	C	2,000	
	SB	2.08 (m)			
	WB	1.00 (m)			
Nebraska City * *	C	45,040	....	.....	....
Norfolk	BC	55,000	C	12,000	162,000
	B	23,000	BC	63,000	
	C	30,000			
North Platte	....	None	U	45,000	90,000
Omaha	SA	1,535,000	....	.....	....
	BC	175,500			
	B	1,570,000			
	C	145,000			
	M	80,000			
	SB	554,000			
	WB	29,500			
Nevada:					
Reno	SA	65,000	SA	12,000	23,000
	BM	44,000	C	3,000	4,050
	C	600	M	25,000	11,250
	M	110,000			
New Hampshire:					
Claremont *	B	None	B	(Indef.)	....
Concord *	B	None	B	None	....
Conway Center *	B	None	B	None	....
Dover	BM	1.50 (m)	....	.....	....
	SB	.25 (m)			
	HA	5,000			
Laconia	BC	17,346	....	(Indef.)	....
	BM	60,000			
	B	245			
	M	16,000			
	SB	4,414			
Lancaster *	B	None	B	None	....
New Jersey (Continued):					
Long Branch	BI	80,000	G	40,000	10,000
	B	24,000			
	G	40.00 (m)			
Morristown	BC	7.75 (m)	BC	5,000	11,000
	G	4.00 (m)	M	3,000	1,800
	M	18.00 (m)			
Newark	SA	1,112,536	U	10.00 (m)	750,000
	AB	41,108			
	BI	712,875			
	BC	15,010			
	BM	3,088			
	B	1,070,461			
	M	549,507			
	SB	1,683,105			
	WB	91,886			
	WA	2,439			
	MI	40,228			
New Brunswick	BC	2.94 (m)	AB	3,150	7,037 (g)
	B	6.92 (m)	BI	18,500	40,150 (g)
	C CT	2.78 (m)	C	6,200	11,000 (g)
	M	(3) 9.43 (m)			
	SB	2.16 (m)			
Newton * *	C	5,109	....	.....	....
North Plainfield	C	.09 (m)	....	(Indef.)	....
	M	14.66 (m)			
Orange	M	7,000	....	"None ordered."	
Paterson * *	CT	1,800	....	.....	....
Perth Amboy *	B	70,000	B	15,000	32,250
Perth Amboy * *	C	1,200	....	.....	....
Plainfield	BM	93,010	....	Not decided	....
	B	15,565			
	C	483			
	CT	3,070			
	AM	14,900			
	M	54.8 (m)			
Rahway	SA	.08 (m)	U	0.75 (m)	....
	AB	.65 (m)			
	BM	5.14 (m)			
	B	1.71 (m)			
	M	11.40 (m)			
	AM	3.05 (m)			
Red Bank	B	1.50 (m)	?	20,000	....
	C	.25 (m)			
Ridgewood	....	......	BC	3,600	7,000
			B	18,000	27,000
			M	5,000	2,500
Roosevelt	CT	31,000	C	8,000	10,000
	M	50,000	M	5,000	4,000
Rutherford	BC	.50 (m)	BM	1.25 (m)	4,000
	BM	10.00 (m)	M	2.20 (m)	18,000
	B	.25 (m)			
	M	21.30 (m)			
	SB	.50 (m)			
Salem *	B	60	B	None	....
Somerville	....	......	....	None	....
Summit	SA	26,981	?	150,000	30,000
	BI	10,000			
	BC	2,766			
	BM	6,055			
	B	2,000			
	M	12,371			
	MI	90,681			
Washington * *	CT	1,500	....	.....	....
Westfield	M	19,000	C	5,000	7,500
			M	12,000	16,000
New Mexico:					
Albuquerque	G	15,500	G	12,000	4,800
			MI	25,000	....
Sioux City * *	C	9,432	....	.....	....
New York:					
Albany	SA	42,452	SA	50,000	90,000
	BC	4,720	BC	15,000	26,000
	B	30,482	B	30,000	63,000
	SB	33,389	SB	80,000	211,000

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TABLE 1.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
New York (Continued):					
Amsterdam *	B	105,434	....	.....	....
Auburn	SA	105,316	SA	15,000	45,000 (g)
	BI	59,255			
	B	110,214			
	SB	6,866			
	M	46.00 (m)			
Ballston Spa	BM	13,948	....	None	....
	B	12,500			
Batavia	BI	8,000	BC	9,000	1.50 (sg)
	BC	26,400	BM	12,000	1.80 (sg)
	B	8,683	B	11,000	2.02 (sg)
	G	5,000	M	2,000	1.00 (sg)
Beacon	BC	27,000	....	.....	....
	B	22,000			
	C	7,400			
	G	102,800			
	M	7,500			
	SB	4,500			
	WB	180			
Binghamton	BI	22,731	BI	3,558	7,025 (g)
	B	357,655	B	8,025	18,725 (g)
	CT	11,454	CT	13,403	24,800 (g)
	WB	4,247			
	M	4.18 (m)			
Buffalo	SA	4,591,817	....	(Indef.)	....
	B	620,304			
	M	269,401			
	SB	1,385,441			
Camden	M	2.50 (m)	M	1,000	800
Canajoharie * *	C	4,400	....	.....	....
Canandaigua	B	36,000 (f)	M	900 (f)	....
	G	60,000 (f)			
	M	24,000 (f)			
Canastota	?	3.00 (m)	....	None	....
Carthage	B	7,500	....	.....	....
Catskill	B	16,500	B	1,300	2,100
Clyde	....	None	....	None	....
Corning	BM	12,609	....	None	....
	B	128,162			
	C	816			
	M	7,721			
	SB	4,398			
Coxsackie	SA	20,839 (6)	....	None	....
Dansville	BM	4.33 (m)	....	None	....
	B	1.00 (m)			
Depew	....	None	C	40,000	....
Dunkirk * *	C	30,205	....	.....	....
Ellenville	C	5,576	C	2,146	3,200 (t)
Elmira	SA	104,650	B	18,412	51,833 (t)
	B	295,160		(Other work is to be done, bringing total cost to about $200,000.)	
	SB	28,102			
	WB	1,530			
	MI	3.50 (m)			
Fort Plain	BM	5,980	M	6,200 (6)	9,000
	B	1.75 (m)	SB	165 (6)	750
Frankfort *	B	None	B	None	....
Fulton	BM	3.7 (m)	B	7,000	16,400
	B	3.7 (m)			
	BT	3.4 (m)			
	M	0.8 (m)			
	SB	0.2 (m)			
Geneva *	B	150,346	B	5,850	12,700
Glens Falls	SA	62,130	C	5,000	6,100
	AB	21,207			
	B	61,527			
	SB	2,700			
	BM	1.72 (m)			
	M	12.40 (m)			
New York (Continued):					
Queens	SA	493,840	....	.....	....
	AB	483,539			
	BC	974,575			
	BM	527,213			
	B	182,368			
	M	2,503,926			
	SB	679,607			
	WB	170,216			
	MI	2,200			
Richmond	SA	2,614	....	.....	....
	AB	76,885			
	BC	349,085			
	BM	273,288			
	B	100,674			
	C	6,541			
	M	1,494,843			
	SB	141,510			
	WB	175,888			
	MI	48,525			
Niagara Falls	SA	367,500	....	(Indef.)	....
	AB	206,700			
	BI	39,300			
	BC	4,972			
	B	146,100			
	SB	2,115			
	WB	1,876			
North Tonawanda	B	5.50 (m)	B	4,175	7,423
	C	1.50 (m)			
Norwich	BI	1.00 (m)	BM	.20 (m)	....
	BM	1.50 (m)			
	B	3.00 (m)			
	G	.50 (m)			
	M	.50 (m)			
Nyack *	B	20,000	B	None	....
Ogdensourg	BI	10,142	....	Not decided	....
	B	75,000			
	SB	1,000			
	M	15.00 (m)			
Oneida	B	3.25 (m)	....	None	....
Oneonta	BM	22,000	....	None ordered yet.	....
	B	99,755			
Oswego	SA	53,064	BM	1,395	1,400
	BM	32,025	B	7,091	14,182
	B	111,733	MI	12,489	18,733
	CT	12,382			
	M	43,372			
	SB	6,578			
	WB	3,555			
Patchogue * *	C	4,000	....	.....	....
Penn Yan *	B	47,520	B	None	....
Perry *	B	None	B	None	....
Plattsburg	SA	448	U	3,000	5,000 (t)
	AB	19,216			
	BM	71,452			
	B	6,515			
	C	8,018			
	CT	1,585			
	WB	2,348			
	G	1.00 (m)			
	M	8.00 (m)			
Port Chester	AB	22,700	....	.....	....
	BI	21,500			
	BM	71,000			
	B	72,000			
	C	7,800			
	M	41,300			
	SB	400			
	WB	7,000			
Port Jervis	BM	2,800	B	5,500	12,255
	B	37,000			

New York (Continued):					
Gloversville	AB	13,430	CT	12,000	22,300 (g)
	BM	22,340			
	B	112,140			
	CT	40,000			
	M	4,660			
Goshen	....	......	....	None	....
Gouverneur *	B	None	B	None	....
Hempstead †	....	......	BI	6,900	....
Homer *	B	18,884	....	.....	....
Hornell *	B	None	B	None	....
Hudson	BM	3,100	BM	30,000	....
	B	30,000	B	2,035	2.60 (st)
	M	350,000		(Total cost of all 1916 work estimated at $38,000.)	
Hudson Falls	BM	2.00 (m)	....	Probably none	....
	B	2.00 (m)			
Ithaca * *	C	2,000	....	.....	....
Jamestown *	B	39,704	B	(Indef.)	....
Jamestown * *	C	1,886	....	.....	....
Johnstown	AB	23,225	BM	10,000	17,000 (t)
	BI	20,614	SB	700	
	BM	18,202			
	B	52,459			
	C	10,000			
	G	30,000			
	M	15,049			
	WB	2,000			
	MI	15,000			
Kingston	BM	.44 (m)	B	4,305	9,677
	B	3.93 (m)			
	SM	75.38 (m)			
	SB	.25 (m)			
Lackawanna *	B	147,840	....	.....	....
Lancaster	B	52,700	B	12,000 (29)	....
Le Roy *	B	None	....	.....	....
Little Falls	BI	37,118	U	.....	50,000
	BM	2,600			
	B	37,144			
	C	500			
	M	20,000			
	SB	5,300			
Massena	BM	17,650	....	.....	....
	B	35,200			
	G	8,000			
	M	15,000			
Middletown	BM	12,000	B	5,000	11,500
Monticello	?	2.00 (m)	?	.50 (m)	6,000
Mount Morris *	B	None	B	None	....
Newburgh *	B	66,341	B	"None yet provided for."	
Newburgh * *	C	3,090	....	.....	....
New Rochelle †	....	......	BI	23,000	....
New York:					
Bronx	SA	1,243,431	SA	70,000	143,500
	AB	1,285,960	BC	60,000	90,000
	BC	422,536	SB	30,000	120,000
	SB	1,216,774			
	WB	121,791			
	MI	31,807			
	M	123 (m)			
Brooklyn	SA	10,148,684	SA	420,000	840,000
	AB	573,920	SB	85,000	340,000
	B	43,809			
	C	400			
	M	2,112,612			
	SB	2,636,351			
	WB	139,316			
Manhattan	SA	4,951,282	SA	322,000	
	AB	1,317,183	SB	181,000	1,400,000 (t)
	SB	2,545,511	WB	25,000	
	WB	737,577			
New York (Continued):					
Poughkeepsie	SA	80,871	B	24,733	53,176
	AB	12,856	WB	2,122	6,366
	BM	49,970			
	B	156,551			
	M	41,223			
	WB	6,852			
Rensselaer	....	......	B	13,500	2.18 (s)
			SB	800	3.35 (s)
			SB	1,100	1.50 (s)
Rochester * *	C	1,000	....	.....	....
Rochester †	....	......	BI	6,900	....
Rome	SA	4.50 (m)	?	2.00 (m)	....
	BI	9.00 (m)			
	B	5.00 (m)			
Sag Harbor	C	2.00 (m)	....	None	....
Salamanca	B	11,800	U	10,000	22,000
Schenectady	SA	871,400	?	4.00 (m)	225,000
	AB	19,400			
	B	75,100			
	C	1,150			
	SB	7,100			
	WB	5,700			
	MI	308,900			
Spring Valley	BM	8,000	....	.....	....
	B	2,000			
Suffern	?	1.00 (m)	....	None	....
Syracuse	SA	1,031,014	SA	50,000	165,000
	BI	3,767	B	30,000	110,000
	BC	13,679			
	BM	31,996			
	B	782,819			
	SB	113,396			
	MI	68,183			
Tonawanda * *	C	17,023	....	.....	....
Troy	SA	126,400	SA	11,000	
	AB	2,010	BI	1,000	100,000 (t)
	BI	150,495	B	9,000	
	BM	41,000	SB	17,000	
	B	348,900			
	C	16,910			
	M	53,000			
	SB	450,800			
Utica	SA	60.18 (m)	U	32,000 (19)	120,000
	AB	.08 (m)			
	BI	7.86 (m)			
	BC	2.88 (m)			
	BM	3.70 (m)			
	B	2.02 (m)			
	M	.93 (m)			
	SB	5.85 (m)			
	WB	.09 (m)			
Walton	BM	13.00 (m)	....	.....	....
	G	12.00 (m)			
Waterloo	?	1.40 (m)	C	24,000	52,000
Watertown	SA	4.00 (m)	WB	9,500	25,000
	BC	.50 (m)			
	BM	2.00 (m)			
	B	3.40 (m)			
	CT	3.10 (m)			
	M	23.00 (m)			
	SB	.50 (m)			
	WB	1.00 (m)			
Watervliet	B	.50 (m)	....	None	....
	SB	4.50 (m)			
Waverly	BI	1.25 (m)	C	3,200 (f)	....
	B	4,000 (f)			
	C	2,000 (f)			
	CT	3,800 (f)			
	G	20.00 (m)			
Whitehall * *	C	7,466	....	.....	....
White Plains *	B	66,528	B	812	2,150
North Carolina:					
Asheville	BI	262,899	BC	20,000	....
	BM	18,330	C	25,000	....
	B	152,282			
	C	8,558			
	M	50,841			
	SB	30,382			
	SC	10,597			

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City	Laid to Jan. 1, 1916. Kind	Laid to Jan. 1, 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Kind	Laid and to be laid during 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Estimated cost, including foundation but not grading
North Carolina (Continued):					
Charlotte	M	40,000	C	2,000	3,000
			M	45,000	22,500
Durham * *	C	1,171	....	.....	....
Greensboro * *	C	13,558	....	.....	....
	CT	49,800			
Lexington	M	35,000	....	.....	....
	SC	1.25 (m)			
Raleigh * *	CT	12,842	....	.....	....
Roxboro	BM	1.00 (m)	....	None	....
Washington	....	......	....	None	....
Wilmington	BI	18,000	....	.....	....
	BM	4,500			
	G	7,000			
Wilson	BM	5,000	SA	50,000	1.40 (s)
	M	60,000	BI	40,000	2.30 (s)
			SB	9,000	2.40 (s)
Winston-Salem †	....	......	BI	3,900	....
North Dakota:					
Bismark	....	None	....	None	....
Devils Lake	....	......	....	None	....
Fargo * *	C	33,928	....	.....	....
Fargo †	....	......	BI	50,368	....
Grand Forks	BC	8,137	....	None	....
	BI	19,907			
	C	58,430			
	M	600			
	SB	3,255			
	WB	92,407			
	MI	55,930			
Mandan	BI	23,000	U	75,000	....
Minot * *	C	19,200	....	.....	....
Ohio:					
Akron	B	1,994,666	B	234,666	....
	WB	93,866	WB	1,606	....
Ashtabula	AB	48,863	....	.....	....
	B	197,691			
	M	1,713			
	SB	12,097			
Barnesville	B	12,000	B	12,000	1.10 (s)
Bellefontaine * *	C	11,000	....	.....	....
Bellevue * *	C	10,467	....	.....	....
	CT	2,660			
Bowling Green * *	C	15,310	....	.....	....
Bucyrus	B	10,000	?	100,000	200,000
Cambridge	AB	5,600	B	20,000	....
	B	16.00 (m)			
Canton	?	50.00 (m)	SA	40,000	670,200 (t)
			B	70,000	
			U	80,000(14)	
Celina	B	60,000	....	None	....
Cincinnati	SA	746,990	SA	1,400	360,000
	BI	186,510	BI	3,000	
	BM	179,831	B	1,200	
	B	1,145,750	C	800	
	C	7,000	M	5,500	
	M	4,963,400	SB	90,900	
	SB	1,855,020	WB	21,150	
	WB	359,540	MI	1,050	
	MI	31,320			
Circleville	B	10,222	....	.....	....
Cleveland	SA	24.80 (m)	B	22.50 (m)	....
	BI	.80 (m)	?	7.50 (m)	....
	BC	1.80 (m)			
	B	420.00 (m)			
	C	1.20 (m)			
	M	2.40 (m)			
	SB	100.40 (m)			
	WB	1.90 (m)			
	MI	3.00 (m)			
Ohio (Continued):					
Niles	B	1,400,000	B	28,305	55,750
	AB	2.43 (m)			
Norwalk * *	C	4,999	....	.....	....
	CT	2,440			
Norwood *	....	......	B	20,000	72,000
Norwood * *	C	11,503	....	.....	....
Oberlin	AB	5,825	B	6,000	....
	B	121,766			
	M	9,115			
	SB	2,420			
Painesville	B	144,987	B	24,355	55,000
	G	24.00 (m)	C	10,000	13,000
Piqua †	....	......	BI	24,000	....
Pomeroy *	B	187,750	B	8,800	11,000
Port Clinton * *	C	2,345	....	.....	....
Salem	AB	60,700	B	24,709	46,000
	B	112,000			
Sandusky	SA	9,750	B	25,780	....
	B	24,908	C	18,800	1.30 (s)
	C	980			
Sidney * *	C	9,793	....	.....	....
Steubenville	B	390,000	B	10,000	20,000
	SB	15,000			
Tiffin	?	30.00 (m)	B	15,493	2.50 (s)
Toledo	SA	61,285	....	.....	....
	AB	28,950			
	BC	18,975			
	BM	5,489			
	B	105,935			
	C	40,000			
	CT	5,674			
	SB	2,978			
	WB	38,406			
Troy	BC	9,645	U	15,630(15)	39,290
	BM	6,782			
	B	22,150			
Uhrichsville	B	114,400	....	None	....
Upper Sandusky	AB	10,000	B	13,000	....
	B	60,000			
	M	5,000			
Urbana	SA	15,689	SA	9,000	16,500
	BM	3,250	B	27,050	43,280
	B	58,490			
	C	2,000			
	G	30,000			
Warren	AB	.90 (m)	B	6.01 (m)	300,000 (t)
	B	15.83 (m)			
	M	3.00 (m)			
Wauseon	....	......	....	None	....
Washington C. H.	?	4.00 (m)	SA	16,825	1.81 (s)
			B	26,471	1.80 (s)
			G	4,466	....
			M	8,253	.80 (s)
Wilmington	?	1.50 (m)	....	(Indef.)	....
Woodsfield *	B	1,100	B	1,500	3,450
Xenia	?	6.00 (m)	B	15,000	35,000
Youngstown †	....	......	BI	9,000	....
Zanesville	B	605,397	B	49,560	114,984
	C	7,952	C	6,948	12,805
Oklahoma:					
Chickasha	SA	213,863	....	.....	....
	B	18,080			
Coalgate	SA	.75 (m)	....	None	....
	B	.50 (m)			
Durant	BM	2.40 (m)	BM	14,000	17,250
	B	1.00 (m)			
Enid	?	17.00 (m)	....	None	....

Ohio (Continued):					
Columbus	SA	1,086,311	....	(Indef.)	....
	B	3,747,980			
	SB	217,280			
	MI	50,450			
Clyde * *	CT	9,610	....	.....	....
Conneaut	B	1,350	SA	15,200	30,000
Coshocton	SA	1.50 (m)	B	17,650	30,000
	B	8.50 (m)	C	3,440	6,000
Cuyahoga Falls	B	3.00 (m)	B	1.00 (m)	....
			M	1.00 (m)	....
Dayton	?	89.00 (m)	B	106,000	1.90 (sg)
			C	5,700	1.60 (sg)
			WB	40,000	3.00-3.25 (sg)
			MI	9,000	3.75 (sg)
			G	2,500 (f)	3,750 (g)
Defiance	....	......	U	20,000	....
Delaware	AB	11,000	B	16,000	34,644
	WB	11,000	C	1,300	.93 (s)
	B	7.00 (m)			
East Cleveland * *	C	2,700	....	.....	....
East Liverpool	B	460,000	....	(Indef.)	....
	C	2,177			
East Palestine	B	3.5 (m)	....	None	....
Eaton * *	C	825	....	.....	....
Elyria * *	C	1,065	....	.....	....
	CT	8,355			
Fostoria	AB	.75 (m)	?	2,600	4,500
	B	13.00 (m)			
	C	.33 (m)			
	M	6.00 (m)			
Franklin	B	50,000	B	12,000	25,000
Fremont	AB	2,216	B	33,544	66,915
	B	259,919			
	C	2,191			
Galion	?	10.00 (m)	SA	20,000	....
Gallipolis	B	24,200 (f)	....	.....	....
Greenville * *	C	7,754	....	.....	....
Hamilton *	B	66,410	B	35,000(29)	63,000
Hillsboro	....	......	....	None	....
Ironton * *	C	21,416	....	.....	....
Lakewood	SA	21.08 (m)	U	100,000	....
	BC	4.03 (m)			
	BM	.56 (m)			
	B	38.05 (m)			
	C	.28 (m)			
	M	.14 (m)			
Lancaster	B	14.00 (m)	B	16,800	16,800
Lebanon * *	C	700	....	.....	....
Lima	SA	5.00 (m)	?	100,000	325,000
	AB	3.00 (m)			
	BC	.50 (m)			
	BM	1.00 (m)			
	B	24.00 (m)			
	C	.50 (m)			
Lorain	SA	110,340	SA	30,000	1.95 (s)
	AB	11,019	B	5,000	2.05 (s)
	BC	155,117			
	BM	9,546			
	B	145,235			
	M	99,739			
	WB	2,800			
Marietta	B	337,683	B	14,913	28,870
	C	4,339			
Marion * *	C	3,500	....	.....	....
Marysville	SA	3,000	B	?	4,000
	B	108,000	M	?	10,000
Massillon * *	C	10,323	....	.....	....
Middleport	B	9.00 (m)	B	25,000	39,334
Middletown * *	C	2,856	....	.....	....
Newark * *	C	2,562	....	.....	....
Newcomerstown	B	8,000	....	None	....
New Philadelphia	....	......	B	23,300	1.65 (s)
			B	7,500	1.80 (s)

Symbols for Different Kinds of Paving.—SA, sheet asphalt; AB, asphalt block; BI, bitulithic; BC, bituminous concrete; BM, bituminous macadam; B, brick; C, cement concrete without bituminous topping; CT, cement concrete with bituminous topping; G, gravel; M, water bound macadam; WB, wood block; SB, stone block; AM, Amiesite; WA, Warrenite; HA, Hassam; SC, sand-clay; RM, rocmac; U, kind not definitely decided upon; MI, miscellaneous—not included in foregoing classification.

Oklahoma (Continued:)					
McAlester	C	7,601	BC	20,000	....
	M	7,000	C	8,000	....
	MI	2.50 (m)			
McMinnville	BC	100,000	BC	35,000	50,000
Muskogee	SA	42.50 (m)	....	None	....
	BM	4.30 (m)			
	B	8.20 (m)			
	C	3.60 (m)			
Norman	SA	11,344	C	5,000	1.35 (s)
	B	10,028			
	G	500			
	MI	26,600			
Oklahoma City	SA	1,969,800	SA	88,000	220,000
	BC	58,800			
	B	39,200			
	MI	49,000			
Okmulgee	BC	57,942	B	46,000	120,000
	B	65,164			
	C	8,000			
Pawhuska	BI	1.50 (m)	....	.....	....
Ponca City	B	1.00 (m)	....	.....	....
	MI	1.00 (m)			
Tulsa * *	C	17,500	....	.....	....
Wagoner	B	2.00 (m)	....	None	....
Oregon:					
Astoria * *	C	8,778	....	.....	....
Astoria †	....	......	BI	5,000	....
Baker City * *	C	444	....	.....	....
Corvallis * *	C	6,045	....	.....	....
Eugene	SA	73,028	....	(Indef.)	....
	BC	52,849			
	BI	184,492			
	M	190,080			
	MI	2,882			
Hood River * *	C	19,000	....	.....	....
Medford	?	20.00 (m)	....	None	....
Portland	SA	107.57 (m)	?	10.00 (m)	350,000
	BI	153.27 (m)			
	BC	23.62 (m)			
	BM	.15 (m)			
	B	1.31 (m)			
	C	26.45 (m)			
	M	56.50 (m)			
	SB	9.39 (m)			
	WB	2.29 (m)			
	MI	1.95 (m)			
	HA	47.76 (m)			
Roseburg * *	C	1,894	....	.....	....
Salem	BI	232,532	....	None to date of making report	....
	BC	92,964			
	BM	30,824			
	C	271,439			
	CT	5,300			
	M	165,790			
Pennsylvania:					
Allentown *	B	8,121	B	1,300	....
Allentown * *	C	1,000	....	.....	....
Altoona	SA	40,336	BI	15,000	30,000
	AB	17,359	B	65,000	123,500
	BI	34,259			
	B	534,502			
	M	4,184			
	SB	16,858			
	WB	1,317			
	MI	1,576			
Ardmore * *	C	2,745	....	.....	....
Athens	B	15,000	B	1,500 }	15,000 (t)
	M	30,000	C	10,000 }	
Avoca	B	26,751	....	None	....
Bangor * *	C	384	....	.....	....
Beaver Falls * *	C	1,355	....	.....	....
Berwick	?	1.25 (m)	AM	3,000	1.10 (s)
			M	1,000	.37 (s)
Bloomsburg *	B	27,250	B	None	....
Braddock	....	......	B	16,500	33,000
Bradford	B	209,200	B	5,000	15,000 (t)
	C	500			
	M	4,481			
	SB	13,783			
	WB	300			

TABLE I.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
City	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Pennsylvania (Continued):					
Bristol *	B	500	....	.....	....
Brookville *	B	6.50 (m)	B	3,300	10,900
Butler	AB	1.50 (m)	....	(Indef.)	....
	B	33.50 (m)			
	WB	3,175			
Carbondale	B	83,285	U	30,000	75,000
Carlisle	BM	14,400	B	8,000	16,000
	B	24,955	C	2,000	2,000
	C	3,578			
Carnegie * *	CT	2,018	....	.....	....
Carrick	B	8,360 (30)	B	7,000	17,500
Catasauqua	BC	9,822	....	(Indef.)	....
	C	4,023			
Chambersburg *	B	20,000	B	14,000	23,800
Chester	SA	161,520	....	.....	....
	B	60,000			
	WB	37,200			
	MI	65,000			
Clearfield	MI	2,040	B	27,000 (22)	70,000 (t)
Coaldale	....	None	....	None	....
Donora * *	C	5,414	....	.....	....
Du Bois	AB	10,699	....	None	....
	C	3,953			
	B	7.00 (m)			
Duquesne	B	10.00 (m)	....	(Indef.)	....
Easton	BC	15,047	....	.....	....
	B	68,069			
	CT	7,541			
	WB	4,683			
	AM	50,566			
	M	36.00 (m)			
East Pittsburgh * *	C	1,847	....	.....	....
Erie	SA	902,270	SA	50,000	100,000 (g)
	AB	9,363			
	B	320,364			
	C	404			
	SB	28,889			
	WB	878			
Farrell	?	3.55 (m)	B	20,000	32,000
Franklin	B	174,704	B	14,000	24,000
Freeland	B	.75 (m)	....	(Indef.)	....
	G	2.00 (m)			
Gettysburg * *	C	7,500	....	.....	....
Gilberton	....	None	....	None	....
Greensburg	?	19.44 (m)	B	5,000	11,000
Greenville	AB	4,733	....	.....	....
	B	77,400			
	C	350			
Hanover * *	CT	556	....	.....	....
Harrisburg	SA	1,128,905	SA	9,000	18,000
	AB	2,817	BC	12,000	17,000
	BI	2,010			
	BC	8,537			
	B	47,710			
	WB	3,175			
Hazleton	BI	8,142	U	40,000	79,000
	B	99,948			
	AM	765			
Hollidaysburg	BI	12,000	....	Not decided	....
	B	20,000			
Honesdale	B	1.00 (m)	....	.....	....
Huntingdon * *	C	1,950	....	.....	....
Indiana * *	C	377	....	.....	....
Jersey Shore *	B	20,500	B	None	....
Johnstown *	B	500,000	B	14,837	28,487
Johnstown * *	C	19,938	....	.....	....
Juniata	B	5,600	C	10,350	14,500
	C	10,052			
Kingston	BI	4,000	B	13,000	35,000 (t)
	B	100,000			
	B	4,000			
Knoxville	B	3,390 (30)	B	3,000	8,500
Lancaster *	B	117,146	B	(Indef.)	....
Pennsylvania (Continued):					
Reading	SA	6.30 (m)	SA	47,627	117,000 (t)
	BC	4.93 (m)	BM	260	
	BM	2.03 (m)	B	7,363	
	B	9.39 (m)			
	C	.16 (m)			
	M	41.62 (m)			
	SB	1.21 (m)			
	WB	.97 (m)			
	MI	17.83 (m)			
St. Marys	B	45,000	....	None	....
Sayre	B	14,000	B	15,000	2.10 (s)
			C	2,000	1.30 (s)
Scranton	SA	723,638	?	64,000	170,000 (t)
	BI	32,539			
	B	131,967			
	SB	71,834			
	WB	279			
	MI	55,793			
Sewickley	SA	.38 (m)	B	3,090	7,470 (g)
	AB	.26 (m)	C	648	1,250 (g)
	BI	.08 (m)			
	BM	.66 (m)			
	B	4.15 (m)			
	M	.51 (m)			
	MI	2.35 (m)			
Sharpsville	BM	1.00 (m)	BM	1.00 (m)	....
	B	2.00 (m)			
Shenandoah *	B	14,700	B	None	....
Shippensburg * *	C	405	....	.....	....
Slatington	CT	4,751	....	.....	....
	M	6,800			
South Bethlehem	BI	58,200	AM	6,270	10,000
	B	2,170			
	AM	26,840			
South Fork	?	2.50 (m)	....	.....	....
Steelton	SA	14,660	....	(Indef.)	150,000 (t)
	WB	38,340			
	WA AM	35,880			
Stroudsburg *	B	15,000	B	6,000	2.18 (s)
Sunbury * *	C	1,028	....	.....	....
Trenton	?	6.00 (m)	G	1.00 (m)	4,500
Tyrone	....	......	....	None	....
Waynesboro	BM	16,094	BM	12,000	5,000
	B	28,628			
	M	10.00 (m)			
West Chester	AB	6,000	AM	1,300	1,200
	B	2,500	M	5,000	7,250
	AM	5,000			
	M	18.00 (m)			
Wilkes Barre	SA	320,747	SA	20,024	244,103
	B	368,919	B	51,850	
	M	1,997	M	1,018	
	SB	13,652	SB	741	
	MI	6,320	MI	504	
Wilkinsburg	C	300	B	.50 (m)	2.00 (s)
	B	26.00 (m)	WB	.25 (m)	2.77 (s)
	SB	1.50 (m)			
	WB	.25 (m)			
Wilmerding	B	89,000	....	.....	....
	SB	750			
Williamsport	SA	3.15 (m)	....	Not decided	....
	B	11.93 (m)			
	C	.09 (m)			
	WB	.04 (m)			
	MI	.06 (m)			
York	SA	7.26 (m)	....	Not decided	....
	AB	.28 (m)			
	BI	4.00 (m)			
	B	2.96 (m)			
	WB	.34 (m)			
	BM	.10 (m)			
	MI	.12 (m)			

Pennsylvania (Continued):					
Lansdowne	BC	3,813	M	10,000	.57 (s)
	BM	8,056	AM	7,500	.90 (s)
	B	856			
	C	2,650			
	M	71,696			
	AM	5,875			
	BI	1.00 (m)			
Lansford	B	31,102	....	.....	....
	M	30,331			
Lebanon	WB	2.20 (m)	WB	30,000	70,000
Lehighton	B	19,100	....	None	....
Lewisburg *	B	8,400	B	10,000	....
Lewistown * *	C	1,519	....	.....	....
Lock Haven	....	......	....	(Indef.)	....
Meadville	?	16.26 (m)	....	(Indef.)	....
McKees Rocks	B	150,000	C	8,000	10,000
	SB	25,000	SB	400	1,500
Meyersdale	?	2.00 (m)	....	None	....
Middletown	M	299,717	B	8,491	10,614
Monongahela City	B	117,271	B	3,168	5,250
Mt. Oliver	B	3,733 (30)	B	4,000	10,000
Mt. Pleasant	B	60,140	B	6,000	15,000
	CT	5,835			
Nazareth	C	2.00 (m)	....	None	....
New Castle	AB	8.00 (m)	B	3.00 (m)	2.00 (s)
	B	21.87 (m)			
Norristown	AB	0.19 (m)	B	19,300	31,000 (t)
	BI	3.48 (m)	WB	2,650	6,000 (t)
	BM	4.21 (m)			
	B	8.18 (m)			
	C	0.51 (m)			
	M	10.22 (m)			
	SB	1.14 (m)			
	AM	0.16 (m)			
North Braddock	B	240,000	B	10,000	2.20 (s)
Northampton	BC	1,556	BC	4,360	17,300 (t)
	C	436	C	5,336	
	M	8,222			
Oil City	SA	6,247	B	710	1,600
	AB	7,870			
	B	309,158			
	C	961			
	WB	1,490			
Old Forge *	B	None	B	None	....
Olyphant	B	50,000	....	.....	....
Philadelphia	SA	8,071,438	U (31)	.....	....
	AB	68,639			
	BC	1,163,655			
	B	2,723,131			
	C	13,295			
	CT	14,795			
	M	2,771,132			
	SB	6,505,395			
	WB	254,716			
	MI	250,300			
Phoenixville	BC	2.00 (m)	....	None	....
	BM	.25 (m)			
	B	1.00 (m)			
	M	5.00 (m)			
Pittsburgh	SA	196.10 (m)	....	"Cannot be estimated; work is all authorized by ordinances of council from time to time."	....
	AB	1.40 (m)			
	BC	.50 (m)			
	BM	1.50 (m)			
	B	76.20 (m)			
	C	.50 (m)			
	M	11.70 (m)			
	SB	235.10 (m)			
	WB	5.50 (m)			
Pittston *	B	110,800	B	16,000	38,400 (t)
Punxsutawney	B	100,000	....	.....	....
Rankin	B	70,000	B	7,000	10,500
	SB	5,000			
Rhode Island:					
Cranston * *	C	1,520	....	.....	....
Newport *	B	None	B	None	....
Pawtucket	SA	1,838	....	(Indef.)	....
	BI	68,090			
	BC	27,248			
	BM	21,246			
	B	2,547			
	SB	99,217			
	G	65.79 (m)			
	M	20.36 (m)			
Providence	SA	168,605	AB	27,398	....
	BI	172,902	BI	13,586	....
	BC	6,014			
	BM	95,750			
	B	6,735			
	M	3,243,386			
	SB	691,343			
	WB	72,577			
Westerly	?	11.00 (m)	BM	52,000	51,000
West Warwick *	B	None	B	None	....
Woonsocket	SB	20,000	BI	8,100	20,000
			C	5,500	2.20 (s)
			SB	33,500	3.96 (s)
South Carolina:					
Charleston	SA	3.60 (m)	SA	16,115	32,775
	BC	.72 (m)			
	B	5.90 (m)			
	G	5.00 (m)			
	M	4.30 (m)			
	SB	17.30 (m)			
	WB	2.30 (m)			
	MI	5.20 (m)			
Columbia	SA	83,000	....	Doubtful	....
	BI	120,000			
	BC	49,000			
	BM	10,100			
	B	43,000			
	C	3,000			
	WB	12,600			
	SC	80.00 (m)			
	G	1.00 (m)			
Dillon	....	None	....	None	....
Florence	?	2.5 (m)	B	14,000	1.43 (sc)
Greenville	SA	8.00 (m)	....	.....	....
	BC	5.00 (m)			
	C	5,000			
	MI	12,000			
Mount Pleasant	C	5.000	....	(Indef.)	....
Spartanburg	?	14.00 (m)	....	None	....
Sumter †	....	......	BI	4,000	....
Union	BM	10,000	?	3,000	3,000 (t)
	M	50,000			
South Dakota:					
Aberdeen * *	C	1,544	....	.....	....
Lead	C	239	C	6,356	13,346
	M	9,270	M	3,000	3,000
Mitchell	BC	9,800	BC	27,100	44,000
	C	26,000	C	4,500	6,030
	WB	3,500			
	G	2.5 (m)			
Pierre * *	C	7,000	....	.....	....
Rapid City * *	C	2,888	....	.....	....
Sioux Falls	BI	7,248	BI	41,578	275,000 (t)
	BC	187,225	BC	85,000	
	C	18,734	C	2,000	
	SB	24,000	SB	17,600	
	WB	17,400			
Watertown	BC	49,606	....	.....	....
	B	1,986			
	C	19,764			
Yankton * *	C	71,690	....	.....	....
Tennessee:					
Bristol * *	C	21,474	....	.....	....

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TABLE 1.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued).

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Tennessee (Continued):					
Chattanooga	SA	6.27 (m)	SA	28,000	50,000
	AB	.69 (m)	BC	26,000	39,000
	BC	10.30 (m)			
	B	7.76 (m)			
	C	.19 (m)			
	G	15.00 (m)			
	M	1.17 (m)			
	SB	1.39 (m)			
	WB	.95 (m)			
Dyersburg * *	C	2,000	....	.....	....
Harriman	BM	.38 (m)	....	None	....
	C	2.00 (m)			
	M	5.50 (m)			
Jackson	BI	8,062	B	50,000	100,000
	G	21.00 (m)	....	1,899	1,139
Knoxville * *	C	47,842	....	.....	....
Memphis	SA	35.30 (m)	SA	3,200	6,868 (t)
	BI	1.56 (m)	C	4,550	10,068 (t)
	BM	23.36 (m)	CT	6,900	13,075 (t)
	B	9.85 (m)			
	C	5.94 (m)			
	CT	2.44 (m)			
	G	95.60 (m)			
	SB	7.66 (m)			
	WB	4.34 (m)			
	MI	.63 (m)			
Nashville	BI	63,566	BI	25,000	40,000
	BM	10,565	BM	30,000	35,000
	B	36,612	B	15,000	35,000
	SB	20,415	SB	20,000	43,000
	WB	10,526	WB	50,000	125,000
Park City	SA	20,000	....	(Indef.)	....
Rockwood	....	None	....	.....	....
Tracy City	....	None	?	1,000	1,250
Whitwell	G	2.00 (m)	G	4.00 (m)	5,000
Texas:					
Amarillo	?	2.50 (m)	U	75,000	120,000
Austin	BI	228,785	BI	100,000	200,000
	B	71,132	C	1,368	2,189
	C	10,237	MI	8,300	13,944
	G	500,000			
	WB	33,700			
Belton * *	C	16,320	....	.....	....
Brownwood	M	11.40 (m)	....	.....	....
Cleburne	G	25.00 (m)	....	(Indef.)	....
Corpus Christi	BI	168,871	BI	20,000	50,000 (t)
Corsicana * *	C	13,682	....	.....	....
Dallas	SA	37,373	?	158,281	462,895 (t)
	BI	743,935			
	BC	19,617			
	BM	164,386			
	B	192,320			
	C	17,632			
	CT	22,053			
	G	410,032			
	M	599,785			
	WB	287,956			
	MI	64,492			
Dennison * *	C	17,574	....	.....	....
El Paso †	....	......	BI	163,175	....
El Paso * *	C	1,673	....	.....	....
Ft. Worth	SA	253,083	BI	50,000	....
	BI	654,710	BM	10,000	10.500
	BC	106,624	B	15,000	30,000
	BM	26,605	WB	25,000	80,000
	B	354,738			
	G	880,000			
	WB	25,765			
	MI	140,122			
Texas (Continued):					
Wichita Falls	BM	20,691	C	55,000	61,500 (t)
	C	42,078			
	WB	46,657			
Yoakum * *	C	31,960	....	..	....
Utah:					
Logan	C	45,000	C	25,000	....
Ogden	SA	184,553	SA	24,000	50,000
	C	17,833			
	M	198,780			
	MI	32,303			
Park City * *	C	7,816	....	.....	....
Pleasant Grove	C	2.00 (m)	C	2.00 (m)	....
Provo	C	18,321	C	9,352	1.15 (s)
Salt Lake City	SA	1,400,000	SA	92,800	184,300
	BI	150,000	BI	31,300	65,700
	BC	16,000	BC	18,902	37,800
	C	17,000	C	40,258	60,400
	M	58,000			
	MI	340,000			
Vermont:					
Bennington	BM	1.00 (m)	....	None	....
Brattleboro	....	......	....	(Indef.)	....
Burlington	BM	1.00 (m)	....	.....	....
	B	.40 (m)			
	G	16.50 (m)			
	M	10.20 (m)			
Fair Haven *	B	None	B	None	....
Montpelier	BC	325	....	.....	....
	BM	4,715			
	G	27,700			
	M	8,389			
Newport *	B	None	B	None	....
Springfield	B	None	B	None	....
Winooski	BC	2,500	....	Not decided	....
	G	1,000			
Virginia:					
Big Stone Gap	M	6.00 (m)	....	None Contemplated.	....
Blackstone	M	1.00 (m)	....	None	....
	SB	.33 (m)			
Danville	BI	30,000	....	(Indef.)	....
	BC	17,000			
	BM	4,000			
	B	56,000			
	C	2,300			
	M	19,000			
	SB	157,000			
Farmville * *	C	7,300	....	.....	....
Fredericksburg	G	65,350	G	25,000	3,000
	M	6,500	MI	25,000	1,250
	SB	16,000			
	MI	50,000			
Hampton	AB	10,000	....	None	....
	B	85,000			
	M	20,000			
	MI	100,000			
Lynchburg	BI	7,666	....	.....	....
	BC	63,428			
	BM	98,607			
	B	43,356			
	C	14,434			
	M	49,940			
	SB	220,362			
	WB	6,844			
Martinsville * *	C	983	....	.....	....

Texas (Continued):					
Galveston * *	C	92,097	....	.....	....
Greenville	BI	65,000	....	None	....
	BC	30,000			
	B	96,000			
	C	7,500			
	WB	25,000			
	MI	3,000			
Hillsboro	BM	5,000	BC	40,000	75,000 (t)
	B	1,500	MI	6,000	
	C	38,000			
	G	30,000			
	MI	36,000			
Houston	SA	90,722	BC	127,711	....
	BI	129,700	G	25,000	....
	BC	110,215			
	B	433,051			
	C	1,531			
	G	1,115,709			
	WB	118,417			
	HA	8,968			
	MI	747,312			
Longview	BM	40,000	B	3,000	6,000
	B	3,000	M	6,000	3,000 (4)
	G	2,000			
	M	10,000			
	WB	16,000			
McKinney	BC	65,619	BC	40,000	70,000
	B	26,495			
Marshall	BI	24,512	C	20,000	1.15-1.25 (s)
	BM	6,500	G	10,000	.40- .60 (s)
	B	2,244	M	4,500	.50- .75 (s)
	C	11,311			
	G	114,996			
	M	1,600			
	SB	18,000			
	MI	11,1[illegible]8			
Palestine	AB	17,314	C	1,800	1.30 (s)
	G	10,000	G	20,000	.35 (s)
	MI	19,323			
Paris * *	CT	9,792	....	.....	....
Paris †		......	BI	18,379	....
San Angelo	BM	43,950	....	None	....
	WB	43,050			
San Antonio	BI	103,800	BI	15,000	34,500
	BC	168,000	BC	31,000	55,800
	BM	4,000	BM	28,000	44,800
	B	180,000	B	47,000	110,450
	C	60,000	C	44,000	63,800
	CT	90,200	CT	100,000	160,000
	MI	173,200	MI	113,000	216,000
Sherman	BC	47,443	BC	18,150	26,704
	B	35,447	BM	2,450	1,852
	C	3,562			
	MI	96,853			
	G	9.14 (m)			
Smithville	G	10.00 (m)	....	None	....
Taylor	WB	19,467	BC	236,000	330,400
			MI	25,000	46,000
Terrell	SA	67,827	SA	13,000	20,000
Tyler	B	22,000	....	(Indef.)	....
	G	2.00 (m)			
Waco	BI	181,144	....	.....	....
	BC	6,744			
	B	115,673			
	WB	8,002			
	HA	2,558			
	MI	6,075			
Waxahachie	BC	17,560	BC	25,000	47,900 (t)
	B	15,850	CT	8,000	
	C	13,600			
	WB	7,480			
	G	55.00 (m)			
Virginia (Continued):					
Newport News	SA	49,000	....	.....	May use $50,000 for street improvements during year.
	AB	38,000			
	BI	38,000			
	BM	10,000			
	B	41,000			
	M	14,000			
	MI	45,800			
Norfolk	SA	519,273	....	.....	....
	AB	32,890			
	BI	172,920			
	BC	24,586			
	BM	15,170			
	B	43,920			
	C	4,259			
	SB	344,432			
	WB	51,483			
	MI	79,900			
Phoebus * *	C	13,333	....	.....	....
Pocahontas * *	C	1,200	....	.....	....
Pulaski	C	21,000	....	.....	....
	M	90,000			
Roanoke	BM	10.63 (m)	....	None	....
	B	4.90 (m)			
	C	.90 (m)			
	M	12.60 (m)			
	SB	1.03 (m)			
South Boston	?	.33 (m)	?	0.50 (m)	25,000
Staunton	B	11.25 (m)	BM	12,000	7,200
	M		B	1,736	3,640
	SB		M	2,000	800
Washington:					
Aberdeen	SA	10.39 (m)	....	.....	....
	BC	.51 (m)			
	B	.67 (m)			
	C	3.15 (m)			
	G	11.39 (m)			
	MI	27.22 (m)			
Anacortes	SA	60,000	....	.....	....
Bellingham	SA	282,000	SA	120,000	160,000
	B	55,000	C	20,000	26,000
	C	95,000	G	12,000	6,000
	G	200,000			
	MI	9,400			
Centralia * *	C	30,430	....	.....	....
	CT	14,000			
Chehalis * *	C	56,225	....	.....	....
Ellensburg * *	CT	1,006	....	.....	....
Everett * *	C	14,579	....	.....	....
Hoquiam * *	C	15,367	....	.....	....
North Yakima	SA	55,990	?	47,413	71,120 (t)
	BI	46,996			
	BC	40,490			
	B	74,410			
	C	13,632			
Olympia	SA	96,810	SA	10,000	12,000
	BI	5,750			
	B	26,390			
	C	3,740			
	WB	7,820			
Seattle	SA	2,519,000	SA	22,200	607,600
	B	1,116,900	B	170,000	630,000
	C	26,400	C	27,000	68,000
	M	25,400	SB	730	3,200
	SB	303,300	WB	5,500	22,000
	WB	35,000	MI	2,350	3,500
	MI	90,200			
Spokane	SA	696,134	WB	9,358	23,390
	BM	123,271	MI	50,591	63,529
	B	233,835			
	C	122,760			
	WB	19,968			
	HA	59,305			
	MI	218,497			

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TABLE I.—KINDS AND AMOUNTS OF PAVEMENTS LAID TO JAN. 1, 1916, AND KINDS, AMOUNTS AND COSTS OF PAVEMENTS LAID AND TO BE LAID DURING 1916, IN CITIES, TOWNS AND VILLAGES OF OVER 3,000 INHABITANTS (Continued)

(For explanation of symbols see foot of first column on opposite page. For notes see end of table.)

City	Laid to Jan. 1, 1916.		Laid and to be laid during 1916.		
	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Washington (Continued):					
Tacoma	SA	1,389,976	SA	20,000	29,000
	BI	10,335	B	12,000	31,200
	BC	31,855	C	6,000	6,600
	BM	10,519			
	B	208,155			
	C	36,778			
	M	7,455			
	SB	197,795			
	WB	12,729			
	MI	3,173			
Vancouver	SA	30,000	....	None	....
	BI	165,000			
	BM	43,000			
	C	15,000			
	CT	1,200			
	G	25,000			
	M	30,000			
Walla Walla	SA	148,839	BC	100,000	100,000
	BI	105,521			
	BC	32,547			
	C	8,200			
West Virginia:					
Bluefield	BM	5.00 (m)	C	1,650	22,500
	B	4.00 (m)	CT	13,350	
	C	3.50 (m)			
	M	1.50 (m)			
Charleston * *	C	30,085	....	.....	....
	CT	6,635			
Charlestown	M	10.00 (m)	....	?	4,000
Clarksburg	B	10,000	?	5,000	10,000
Elkins *	B	47,400	B	5,600	....
Fairmount *	B	300,000	B	8,000	8,500
Grafton	B	6.50 (m)	B	4,760	1.90 (s)
Huntington * *	C	900	....	.....	....
Mannington	B	42,250	....	None	....
Martinsburg	?	0.50 (m)	SA	7,000	4,000
			B	7,000	20,000
Moundsville	B	160,000	B	10,000	12,000
Parkersburg * *	C	8,701	....	.....	....
Weirton	B	12,533	....	None	....
Wisconsin:					
Antigo	SA	4,800	....	None	....
	M	20,000			
	MI	5,000			
Appleton	SA	6.37 (m)	B	10,000	22,000
	B	1.97 (m)	SB	2,300	....
	C	3.05 (m)			
	G	20.06 (m)			
	SB	.28 (m)			
	WB	1.02 (m)			
Ashland *	....	......	B	None	....
Ashland * *	C	3,456	....	.....	....
Beloit	?	14.00 (m)	SA	64,000	1.25 (s)
			BC	16,000	1.18 (s)
			B	14,000	2.00 (s)
Berlin	....	......	....	None	....
Chippewa Falls	C	850	....	.....	....
Cudahy	BC	3.50 (m)	....	None	....
	M	2.00 (m)			
De Pere * *	C	26,000	....	.....	....
Eau Clair	C	22,000	BM	3,300	22,000 (t)
	WB	3,670	C	12,000	
Fond du Lac	SA	44,357	BC	22,000	....
	BC	14,615	C	25,000	....
	B	77,829	M	5,000	....
	C	215,168			
	G	10,000			
	M	15,000			
Grand Rapids	B	11,000	B	3,000	6,420
			C	20,000	27,600
Wisconsin (Continued):					
Superior	SA	147,780	C	100,000	150,000
	BI	23,985			
	BM	17,000			
	B	14,350			
	C	252,807			
	M	224,532			
	SB	26,132			
	WB	21,016			
Tomahawk	G	5.50 (m)	....	None	....
Two Rivers	BM	35,750	BM	6,500	7,100
	M	63,500			
Watertown * *	C	39,347	....	.....	....
Wausau	BM	17,600	BM	20,000	14,000 (t)
			B	15,869	34,200 (t)
Wauwautosa *	B	3,410	B	None	....
West Allis	SA	95,000	C	23,450	32,500
	BC	35,700	WB	15,450	36,307
Whitewater	M	3.00 (m)	C	30,000	40,000
Wyoming:					
Cheyenne	G	1,998	....	.....	....
Laramie	G	40,400	G	20,000	4,000
Rock Springs	C	1,917	....	None	....
Sheridan	BI	77,961	....	(Indef.)	....
	C	21,805			
	WB	71,844			

Additional reports received too late to be inserted in alphabetical order in foregoing.

City	Kind	Amount (Sq. yds.)	Kind	Amount (Sq. yds.)	Estimated cost, including foundation but not grading
Alabama:					
Anniston *	B	None	B	None	....
Birmingham † †	SA	16,000	....	.....	....
Huntsville † †	BC	12,950	....	.....	....
Jasper *	B	None	....	None	....
Montgomery *	B	162,677	....	.....	....
Sheffield *	B	None	B	None	....
Tuscaloosa *	B	None	B	None	....
California:					
Sacramento	SA	31.00 (m)	?	150,000	500,000
	BI	7.00 (m)			
	BM	45.00 (m)			
	C	31.00 (m)			
	G	2.00 (m)			
	M	4.00 (m)			
	SB	1.00 (m)			
Florida:					
Fernandina *	B	None	B	None	....
Gainesville *	B	84,000	B	15,000	....
Lakeland *	B	52,800	....	None	....
Live Oak *	B	35,000	B	6,385	1.74 (s)
St. Augustine *	B	46,500	....	.....	....
Tampa	SA	8,315	AB	140,000	....
	AB	291,150	C	3,800	....
	BI	88,520			
	BM	19,000			
	B	1,127,000			
Georgia:					
Albany *	B	35,723	B	None	....
Cartersville *	B	None	B	None	....
Cedartown *	B	None	B	None	....
Columbus *	B	71,250	....	.....	....
Cordele *	B	None	B	None	....
Fort Valley *	B	None	B	None	....
Newnan *	B	None	....	.....	....
Statesboro *	B	None	B	None	....
Illinois:					
Anna	B	35,650	....	None	....
Harvey *	....	......	B	44,000	....

Wisconsin (Continued):					
Green Bay * *	C	46,892	....	.....	....
Hurley	B	5 (b)	....	None	....
Janesville	BM	19,710	BM	14,458	16,000
	B	48,538	B	12,476	21,000
	M	179,535			
Jefferson * *	C	13,570	....	.....	....
Kaukauna	....	None	U	9,000	....
Kenosha * *	C	9,120	....	.....	....
La Crosse	BM	18,100	B	5,000	11,000 (t)
	B	10,660			
Lake Geneva	B	2,600	....	None contemplated.	....
	C	5,200			
	G	100,000			
	WB	23,000			
Lancaster *	B	None	B	None	....
Madison	SA	6.84 (m)	SA	38,599	220,000 (16)
	BC	5.84 (m)	BC	8,896	
	BM	8.02 (m)	BM	4,366	
	B	1.00 (m)	C	5,830	
	C	1.33 (m)	SB	286	
	M	25.13 (m)	WB	,894	
	SB	.08 (m)			
	WB	.58 (m)			
Marinette	C	22,463	C	10,760	18,962
	B	2,875 (m)			
	M	17,000 (m)			
Menasha	?	5.00 (m)	....	None	....
Menomonee	B	11,000	C	6,000	12,000 (t)
	C	12,000	MI	1,000	
	G	1,000			
	M	5,000			
	MI	19,000			
Milwaukee * *	C	99,776	....	.....	....
Neenah * *	C	5,544	....	.....	....
New London	C	1.50 (m)	C	30,000	38,000
Oshkosh	?	54.42	U	41,410	....
Plymouth * *	C	38,028	....	.....	....
Portage	B	35,000	B	10,000	15,000
	C	10,000	C	14,000	21,000
	M	200,000			
Port Washington *	B	None	....	.....	....
Port Washington * *	C	15,000	....	.....	....
Racine	SA	118,240	SA	19,942	46,987 (g)
	BC	6,964	BC	4,491	9,751 (g)
	BM	7,614	B	39,148	86,699 (g)
	B	490,002			
	C	3,784			
	M	58,069			
Reedsburg	B	59,368	....	None	....
	G	4,155			
Richland Center	BM	21,000	BC	34,000	56,500
	C	8,500			
	M	32,000			
Ripon	B	1.25 (m)	....	(Indef.)	....
	G	9.00 (m)			
	M	5.75 (m)			
Sheboygan	BM	17,378	....	(Indef.)	....
	B	132,987			
	C	221,489			
	G	30,257			
	M	230,287			
	SB	1,680			
	WB	30,945			
S. Milwaukee * *	C	20,500	....	.....	....
Stanley *	B	5,000	B	None	....
Stevens Point *	B	None	B	15,000	1.35 (s)
Sturgeon Bay	M	10.00 (m)	....	None	....
Illinois (Continued):					
La Salle *	B	16.00 (m)	B	40,000	102,000
Lincoln	....	......	.....	None	....
Naperville	C	6,000	BM	60,000	93,000 (t)
	M	80,000			
Peru	B	198,000	B	34,773	75,286
	M	15,000			
	G	1.00 (m)			
Indiana:					
Crown Point	BM	15,000	?	17,000	10,000 (t)
	B	8,000			
	G	7,000			
	M	35,000			
Evansville † †	SA	89,091	....	.....	....
Greenfield	G	70,000	....	None	....
Jeffersonville	B	3.00 (m)	M	6,634	....
	M	13.00 (m)			
Michigan City *	B	256,341	B	6,160	8,584
New Castle	....	......	SA	5,706	64,241 (t)
			B	18,408	
			M	15.00 (m)	
New Castle † †	SA	6,000	....	.....	....
Iowa:					
Cresco	B	9,000	C	3,800	5,700
	C	18,666			
	CT	17,000			
Dubuque	BC	69,323	C	1,000	1,500
	BM	13,245	M	10,000	8,000
	B	392,975	U	70,000	....
	C	3,498			
	M	292,900			
	WB	21,021			
Waterloo	SA	700,000	SA	25,000	50,000
	BC	50,000	BC	15,000	25,000
	B	112,000			
	C	3,000			
Kansas:					
Wellington † †	BC	42,207	....	.....	....
Kentucky:					
Covington † †	SA	570	....	.....	....
Newport † †	SA	3,435	....	.....	....
Nicholasville † †	BC	4,500	....	.....	....
Winchester † †	SA	8,000	....	.....	....
Louisiana:					
Donaldsonville *	B	None	B	None	....
Kentwood *	B	4,000	B	None	....
Massachusetts:					
Holyoke † †	BC	13,000	....	.....	....
Michigan:					
Houghton *	B	10,000	....	.....	....
Niles	....	......	.....	None	....
Minnesota:					
Fergus Falls *	B	None	B	None	....
Mississippi:					
Clarksdale *	B	None	B	None	....
Greenwood *	B	None	B	None	....
Jackson *	B	60,000	B	None	....
Jackson † †	SA	22,000	....	.....	....
Laurel *	B	1,500	B	None	....
Missouri:					
De Soto *	B	None	....	.....	....
Hayti	....	None	B	6,000	....
Walker *	B	None	B	None	....
New Jersey:					
Dover	BC	12,500	BC	5,000	....
			B	1,500	....
New Hampshire:					
Portsmouth	SA	13,500	....	.....	....
	BI	12,100			
	B	11,000			
	SB	3,200			
New Mexico:					
Roswell	?	2.00 (m)	....	None	....

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(For explanation of symbols see foot of first column on this page. For notes see end of table.)

City	Laid to Jan. 1, 1916. Kind	Laid to Jan. 1, 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Kind	Laid and to be laid during 1916. Amount (Sq. yds.)	Laid and to be laid during 1916. Estimated cost, including foundation but not grading
New York:					
Nyack	?	1.00 (m)	....	None	....
Tupper Lake ††	BM	13,500	....	.....	....
Whitehall *	B	15,000			
North Carolina:			....	.....	....
Durham *	B	7,000	....	.....	....
Goldsboro *	B	1,310	....	.....	....
Kinston ††	SA	92,467	....	.....	....
Mt. Airy *	B	None	B	None	....
New Bern ††	BM	15,000	....	.....	....
Raleigh	SA	40,000	BC	32,000	50,000
	BC	187,000			
	BM	11,000			
	WB	10,000			
	MI	36,000			
Rocky Mount	SA	48,500	BI	11,333	....
	B	37,500			
Ohio:					
Alliance ††	BC	29,600	....	.....	....
Hamilton ††	SA	37,800	....	.....	....
Kenton ††	SA	10,606	....	.....	....
Youngstown *	B	1,574,000	B	100,000	225,000
Pennsylvania:					
Bloomsburg	B	27,250	....	None	....
Darby ††	BC	60,000	....	.....	....
McKeesport *	B	30.89 (m)	B	11,193 (31)	....
Mahanoy City ††	BC	11,000	....	.....	....
Sharpsburg ††	BM	15,380	....	.....	....
West Pittston ††	BM	16,615	....	.....	....
Rhode Island:					
Cranston ††	SA	20,000	....	.....	....
East Providence ††	SA	17,000	....	.....	....
West Warwick	MI	3,000	BM	3,775	2,500
South Carolina:					
Bennettsville *	B	None	B	None	....
Edisto Island *	B	None	B	None	....
Greenwood *	B	40,000	B	15,000	27,750
Greenwood ††	BC	70,000	....	.....	....
Laurens *	B	25,000	B	None	....
Marion *	B	None	B	None	....
Sumpter *	....	.....	B	25,000	1.45 (s)
Tennessee:					
Clarksville *	B	None	B	None	....
Columbia ††	BC	29,700	....	.....	....
Knoxville ††	SA	42,940	....	.....	....
	BM	4,000			
Paris *	B	None	B	None	....
Trenton *	B	None	B	None	....
Union City *	B	None	B	None	....
Texas:					
Ennis	B	26,000	B	None	....
Houston Heights	B	46,105	....	.....	....
	G	98,560			
Orange *	B	None	B	None	....
Virginia:					
Farmville *	B	None	B	None	....
Petersburg ††	SA	1,500	....	.....	....
	BC	3,000			
Salem *	B	None	B	None	....
Winchester *	B	3,075	....	.....	....
Washington:					
Chehalis *	B	19,000	B	None	....
Hoquiam	SA	.39 (m)	MI	15,030	8,700
	BI	.86 (m)			
	B	.75 (m)			
	C	1.37 (m)			
	CT	2.96 (m)			
	MI	20.77 (m)			
West Virginia:					
Elkins	?	2.60 (m)	B	550	1,300
Wisconsin:					
Milwaukee	SA	1,500,000	SA	300,000	570,000
	BC	10,000	BC	100,000	125,000
	BM	50,000	B	30,000	60,000
	B	43,000	C	30,000	36,000
	C	10,000	SB	20,000	60,000
	SB	260,000	WB	30,000	75,000
	WB	140,000			
Oconomowoc ††	BC	10,680	....	.....	....
Oconto ††	SA	15,000	....	.....	....
Stevens Point ††	BC	10,000	....	.....	....

Symbols for Different Kinds of Paving.—SA, sheet asphalt; AB, asphalt block; BI, bitulithic; BC, bituminous concrete; BM, bituminous macadam; B, brick; C, cement concrete without bituminous topping; CT, cement concrete with bituminous topping; G, gravel; M, water bound macadam; WB, wood block; SB, stone block; AM, Amiesite; WA, Warrenite; HA, Hassam; SC, sand-clay; RM, rocmac; U, kind not definitely decided upon; MI, miscellaneous—not included in foregoing classification.

Notes on Table I.

*Partial report secured through the courtesy of the National Paving Brick Manufacturers' Association; **Partial report secured through the courtesy of the Portland Cement Association; †Partial report secured through the courtesy of the Warren Brothers Co. Data covers only work for which contracts have been let in 1916; ††Partial report secured through the courtesy of the Barber Asphalt Paving Co. Data covers only work done in 1916.

(m) miles; (f) lin. ft.; (b) "blocks"; (t) total cost; (s) cost per sq. yd.; (c) cost to city; (g) includes grading or other items besides foundation; (indef.) not known at date report was made.

(1) concrete resurfaced with bitulithic; (2) all roads gravel or earth; (3) "mud" bound; (4) repaving; (5) figures for July 1, 1915; (6) state road; (7) under contract at date of report; (8) not over 8,783 sq. yds. to be laid, probably concrete; (9) amount to Sept. 1, 1916; (10) amount not known; (11) total amount; (12) "grading all streets to profile and constructing sand-clay roadbeds"; (13) streets surfaced with native oyster shells; (14) to be brick or sheet asphalt; (15) to be bituminous concrete, bituminous macadam or brick; (16) total cost, including that of storm sewer work; (17) repaving; (18) figures given are for wards 1 to 12 only; in outlying wards there are 21 (±) miles of macadam and 1.3 (±) miles of bituminous macadam; (19) to be asphalt block, bitulithic or bituminous concrete; (20) to be brick, sheet asphalt or concrete; (21) street work not to be undertaken until after completion of work on the sewer system now being installed; (22) 5,000 sq. yds. new work; 22,000 sq. yds. repaving; (23) includes "Topeka" also; (24) may be bonds to amount of $200,000 available; (25) this amount awarded at date of report; more to be done later; (26) estimate made on higher-priced material according to law; (27) includes 3,758,300 sq. yds. of rock asphalt; (28) experimental section of pavement; (29) may or may not be brick; (30) laid in 1915; (31) total probable expenditure for construction, reconstruction and maintenance, $5,850,000; (31) 1916 work includes both paving and repaving; the yardage in column for work to 1916 is paving and repaving in 1915, and the mileage in same column is work done up to 1915.

TABLE II—CONSTRUCTION DETAILS—SHEET ASPHALT.

City.	Kind.	Foundation		Wearing Surface			
		Proportions (For concrete)	Depth (Ins)	Number of courses	Depth of each course (Ins)	Total depth (Ins.)	Length of guarantee period (Years)
California.							
Los Angeles	Concrete	1:3:6	5	2	1 -2	3	None
San Francisco	Concrete	1:2½:7	6	2 1 1	1½-1 2 2½	2½ 2 2½	None
Connecticut.							
Bridgeport	Concrete	1:3:6	6	2	1½-1½	3	5
Hartford	Concrete	1:3:6	6	2	1½-1½	3	5
New Haven	Concrete Old mac.	1:3:6	4-5 ..	2	1½-1½	3	5
District of Columbia.							
Washington	Concrete	1:3:7	6	2	2 -2½	4½	5
Illinois.							
Chicago	Concrete	1:3:6	6	2	1½-2	3½	5
Indiana.							
Fort Wayne	Concrete	1:3:6	6	2	1 -1½	2½	5
Indianapolis	Concrete	1:3:5	6	2	2 -1	3	5
South Bend	Concrete	...	7	1	....	..	5
Terre Haute	Concrtee	1:6	6	2	1 -1½	2½	5
Iowa.							
Des Moines	Concrete	1:3:6	5	2	1-1½ 1-2½	2½ 3½	5
Kentucky.							
Louisville	Concrete	1:3:6	6	2	1 -2	3	5
Louisiana.							
New Orleans	Concrete	1:2:4½	6	2	....	3	5
Maryland.							
Baltimore	Concrete	1:3:6	6	2	1½-1½	3	5
Massachusetts.							
Boston	Concrete	1:3:7	6	2	1½-1½	3	..
Springfield	Concrete	1:3:6	5	2	1 -1½	2½	5-10
Worcester	Concrete	1:3:6	4-6	1	....	2	..
Michigan.							
Detroit	Concrete	1:3:6	6	2	1½-2	3½	10
Grand Rapids	Concrete	1:3½:7	6	2	1 -2	3	5
Minnesota.							
Duluth	Concrete	1:3:6	6	..	....	..	3
Missouri.							
St. Louis	Concrete	1:3:6	5	2	....	2¾	1
New Jersey.							
Bayonne	Concrete	1:3:6	5	2	1½-1½	3	5-10
Elizabeth	Concrete	1:3:6	6	2	1½-1½	3	5
Jersey City	Concrete	1:3:5	5	..	....	..	10
Newark	Concrete	....	6	2	1½-1½ 1½-2	3 3½	5
Trenton		....	..	..	....	2	[illegible]
New York.							
Albany	Concrete	1:3:6	6	2	1 -2	3	[illegible]
Buffalo	Concrete	1:8 1:10	6	2	2 -1½	3½	10
New York:							
Boro. Brooklyn	Concrete	1:3:6	5 6	2	1 -2	3	5
Manhattan	Concrete	1:3:6	6	2	1½-1½	3	5
Queens	Concrete	1:3:6	6	2	1 -2	3	[illegible]
The Bronx	Concrete	1:3:6	6	2	1 -2	3	5
Schenectady	Concrete	1:3:6	6	2	1 -2	3	5
Syracuse	Concrete	1:3:6	6	2	1 -2	3	5 10
Troy	Concrete	1:3:6	6	2	....	3	5
Ohio.							
Cincinnati	Concrete	1:3:6	6-8	2	1½-1½	3	[illegible]
Columbus	Concrete	1:2½:5	6	..	....	..	5
Toledo	Concrete	1:3½:6	6	2	1½-1½	3	5
Oklahoma.							
Oklahoma City	Concrete	1:2:4	4	1	....	2	5
Oregon.							
Portland	Concrete	1:3:6	5	2	1 -2	3	10
Pennsylvania.							
Erie	Concrete	1:2½:7	5	2	1½-1½	3	[illegible]
Harrisburg	Concrete	1:2:6	6	[illegible]	1 -2	3	[illegible]
Philadelphia	Concrete	1:3:6	6	2	1 -1½	2½	5
Pittsburgh	Concrete	1:3:6	6	[illegible]	1½-1½	3	[illegible]
Reading	Concrete	1:3:6	6	[illegible]	1½-1½	3	5
Scranton	Concrete	1:3:6	6	2	1 -2	3	5
Wilkes-Barre	Concrete	1:3:6	6	..	....	3½	10
Rhode Island.							
Providence	Concrete	1:3:6	6	2	1½-1½	3	5
South Carolina.							
Charleston	Concrete	1:3:6	4–6	2	1½-1½	3	5
Tennessee.							
Memphis	Concrete	1:3:6	6	2	1 -2	3	[illegible]
Texas.							
Dallas	Concrete	1:8	5–6	2	1½-1½	3	5
Fort Worth	Concrete	1:9	5	2	1 -2	3	5
Houston	Concrete	1:3:6	5–6	1	(a)	(a)	5
Utah.							
Salt Lake City	Concrete	1:3:6	[illegible]	2	1½-1½	3	5
Virginia.							
Norfolk	Concrete	1:3:6	5–6		1 -1½ 1 -2	2½ 3	5
Washington.							
Seattle	Concrete	1:3:6	5–6	2	1 -2	3	..
Spokane	Concrete	1:3:6	5	1	....	2	..
Tacoma	Concrete	1:3:6	5	2	1 -1½	2½	..
Wisconsin.							
Milwaukee	Concrete	1:3:6	5–6	2	1½-1 1½-1½	2½ 3	5

(a) On residence streets 2 ins., on business streets 2½ or 3 ins.

TABLE IV.—CONSTRUCTION DETAILS—BITULITHIC

City	Foundation			Wearing Surface	
	Kind	Proportions (for Concrete)	Depth (Ins.)	Depth (Ins.)	Length of Guarantee Period (Yrs.)
California.					
Los Angeles	Concrete Bit. concrete	1:3:6	5	2	None
Indiana.					
Terre Haute	Concrete	....	6	2	5
Iowa.					
Des Moines	Concrete	1:3:6	5	2	5
Louisiana.					
New Orleans	Concrete	1:2:4½	6	3	5
Maryland.					
Baltimore	......	....	..	..	5
Massachusetts.					
Boston	Concrete	1:3:7	6	2	5
Cambridge	Concrete	....	[illegible]	2	5
Fall River	Concrete Old macadam	1:3:6	4 ..	2	5
Springfield	Concrete	1:3:6	5	2	5
Minnesota.					
Duluth	Concrete	1:3:6	6	..	3

TABLE III.—CONSTRUCTION DETAILS—ASPHALT BLOCK PAVEMENT

City	Foundation			Wearing Surface			
	Kind	Proportions (For concrete)	Depth (Ins.)	Is Sand Cushion Used?	Depth of Sand Cushion (Ins.)	Kind of Filler Used	Length of Guarantee Period (Years)
Washington, D. C.	Concrete	1:3:7	6	......	..	......	5
Baltimore, Md.	Concrete	....	6	......	..	......	..
Boston, Mass.	Concrete	1:3:7	6	......	..	......	..
Springfield, Mass.	Concrete	1:3:6	[illegible]	Yes	½	......	..
Grand Rapids, Mich.	Concrete(a)	1:3½:7	6	(b)	..	Sand	5
Jersey City, N. J.	Concrete	1:3:6	6	......	..	......	5
Newark, N. J.	Concrete	....	6	......	..	Sand	5
New York, N. Y.—							
Borough of Brooklyn	Concrete	1:3:6	5 6	(b)	..	Sand	5
Borough of Manhattan	Concrete	1:3:6	6	Yes	½	Sand	5
Borough of Queens	Concrete	1:3:6	[illegible]	(b)	..	Sand	5
Borough of Richmond	Concrete	1:3:6(c)	6	(b)	..	Sand	5
Borough of The Bronx	Concrete	1:3:6	5½	(b)	..	Sand	5
Schenectady, N. Y.	Concrete	1:3:6	6	......	..	......	..
Toledo, O.	Concrete	1:3½:6	6	(b)	..	......	5
Harrisburg, Pa.	Concrete	1:2:6	6	Yes	2	Sand	5
Pittsburgh, Pa.	Concrete	1:3:6	6	......	..	......	5
Norfolk, Va.	Concrete	1:3:6	5-6	(b)	..	Cement	5

(a) Old gravel also used; (b) ½-in. mortar bed; (c) 1:6, screenings, also used.

TABLE IV.—CONSTRUCTION DETAILS—BITULITHIC (Continued).

City	Foundation Kind	Foundation Proportions (for Concrete)	Foundation Depth (Ins.)	Wearing Surface Depth (Ins.)	Wearing Surface No. of Courses	Length of Guarantee Period (Yrs.)
New Jersey.						
Bayonne	Concrete Old macadam	1:3:6	5 ..	2½		5
Newark	Concrete	....	6	2½		..
New York.						
Syracuse	Crushed stone	....	6	2		..
Troy	Concrete	1:3:6	6	2		5
Utica	Concrete	1:3:7	5	2		5
Ohio.						
Cincinnati	Concrete	1:3:6	6	2		5
Oregon.						
Portland	Crushed stone	....	4	2		10
Pennsylvania.						
Harrisburg	Stone	....	4	2		5
Scranton	Concrete	1:3:6	6	2		5
Rhode Island.						
Providence	Concrete	1:3:6	[illegible]	2		5
Tennessee.						
Nashville	Macadam	....	[illegible]	2		[illegible]
Texas.						
Dallas	Concrete	1:8	5-6	2		5
Fort Worth	Concrete	1:9	[illegible]	2		1
Houston	Concrete	1:3:6	6	2		5-10
San Antonio	Concrete	1:3:6	5	[illegible]		5
Utah.						
Salt Lake City	Bit. macadam	....	4	2		..
Virginia.						
Norfolk	Concrete	1:3:6	4-5	2		5

TABLE V.—CONSTRUCTION DETAILS—BITUMINOUS CONCRETE (MIXING METHOD).

City	Foundation Kind	Foundation Proportions (For concrete)	Foundation Depth (Ins.)	Wearing Surface Depth (Ins.)	Wearing Surface No. of Courses	Length of Guarantee Period (Yrs.)
California:						
Los Angeles	Concrete Bit. Con.	1:3:6	5	2	1	..
San Francisco	Concrete	1:2½:7	6	2	1	None
Connecticut:						
Bridgeport	Old Mac.	....	5-7	2	..	..
District of Columbia.						
Washington	Concrete	1:3:7	6	2	1	5
Indiana:						
Indianapolis	Concrete	1:3:5	6	2	1	5
South Bend	Concrete	....	5	2	1	5
Kentucky:						
Louisville	Concrete	1:3:6	6	2	1	5
Maryland:						
Baltimore	Concrete	1.3:6	4	6	2	5
Massachusetts:						
New Bedford	Concrete Broken St.	1:3:5	4 4-6	2	..	..
Springfield	W. B. Mac.	....	4-6	2	..	..
Michigan.						
Grand Rapids	Concrete	1:3½.7	6	2	1	5
Minnesota.						
St. Paul	Concrete	1:2:5	5	2	..	1
New Jersey.						
Elizabeth	Telford	9	3	3	2	5
Newark	Concrete	....	[illegible]	..	..	..
New York.						
Albany	Concrete	1:3:6	6	2	1	5
New York—						
Boro. of Queens	Concrete Macadam	1:3:6	6 ..	[illegible]	1	5
Boro. of Richmond	Concrete Old Mac.	1:3:6	6 ..	2	1	5
Boro. of The Bronx	Concrete	1:3:6	4-6	2	1	5
Ohio.						
Toledo	Concrete	1:3½:6	6	[illegible]	1	5
Oregon.						
Portland	Concrete	1:3:6	5	2½	2	10
Pennsylvania.						
Harrisburg	Concrete	1:2:6	4	2	1	5
Philadelphia	Concrete	1:3:6	5	2	1	3
Pittsbu:gh	Concrete	1:3.6	6	2	..	5
Reading	Concrete	1:3:6	..	2	1	..
South Carolina.						
Charleston	Concrete	1:3:6	4-6	2	1	5
Texas.						
Dallas	Concrete	1:8	5-6	2	1	5
Fort Worth	Concrete	1:9	5	2	1	5
Houston	Concrete	1:3:6	6	2	1	5-10
San Antonio	Concrete	1:3:6	5	2	2	5
Utah.						
Salt Lake City	Concrete	1:3:6	5	2	1	5
Virginia.						
Norfolk	Concrete	1:3:6	4	2	1	5
Wisconsin.						
Milwaukee	Concrete	1:3:6	5	2	1	1

TABLE VI.—CONSTRUCTION DETAILS—BITUMINOUS MACADAM (PENETRATION METHOD).

City	Foundation Kind	Foundation Depth (Ins.)	Wearing Surface Depth (Ins.)	Binder Applied by Gravity or Under Pressure	Length of Guarantee Period (Yrs.)
California.					
Los Angeles	Macadam	4	2	Gravity	.....
Connecticut.					
New Haven	Crushed St.	4	2	Pressure	1
Illinois.					
Chicago	Slag or Limestone	8	..	Pressure	.....
Kentucky.					
Louisville	Old Mac.	..	..	Gravity	.....
Louisiana.					
New Orleans	Slag	6	6	Gravity	.....
Maine.					
Portland	Gravel	..	6	Gravity	.....
Massachusetts.					
Boston	......	..	6	Pressure	.....
Brockton	......	5	2	Gravity	.....
Lowell	Natural	..	5	Pressure	.....
Lynn	......	..	5	Pressure	.....
New Bedford	Local Stone	4-6	2	Pressure	.....
Springfield	W. B. Mac.	4-6	2	Pressure	.....
Worcester	Gravel	..	4-6	Pressure	.....
Michigan.					
Grand Rapids	Cobble	5	4	Gravity	5
Minnesota.					
Duluth	Concrete	6	..	Pressure	8
New Jersey.					
Bayonne	......	..	..	Gravity	1
Newark	Concrete	6	..	......	.....
New York.					
New York—					
Boro. of Queens	Concrete Macadam	5-8	..	Both	.....
Boro. of Richmond	Broken St.	4	2½	Gravity	1
Syracuse	Broken St.	6	3	Pressure	2
Ohio.					
Cincinnati	......	9	3	Gravity	1
Toledo	......	..	10	Gravity	5
Pennsylvania.					
Pittsburgh	Broken St.	6	3	......	1
Reading	Earth	..	7	......	5
Rhode Island.					
Providence	Broken St. or Gravel	5	2⅜	Pressure	.....
Tennessee.					
Nashville	Macadam	6	3	Gravity	5
Texas.					
Forth Worth	Stone	4	2	Both	1
San Antonio	Macadam	4½	3	Gravity	1
Virginia.					
Norfolk	Concrete or Stone	..	2	Gravity	.....
Wisconsin.					
Milwaukee	W. B. Mac.	6	2	......	.....

TABLE VII.—CONSTRUCTION DETAILS—BRICK.

City	Foundation Kind	Foundation Proportions (For Concrete)	Foundation Depth (Ins.)	Bed Kind	Bed Depth (Ins.)	Wearing Surface Kind of Filler Used	Wearing Surface Length of Guarantee Period (Years)
California.							
Los Angeles	Concrete	1:3:6	5	Sand	2	Grout	.....
San Francisco	Concrete	....	4-6	Sand	1½	Cement	None
Connecticut.							
Bridgeport	Concrete	1:3:6	6	Sand	1½	Cement	5
New Haven	Concrete	1:3:6	6	Sand	1	Grout	5
Florida.							
Jacksonville	Concrete	1:3:5	6	....	..	Grout	.....

TABLE VII.—CONSTRUCTION DETAILS—BRICK (Continued).

	Foundation			Bed		Wearing Surface	
City	Kind	Proportions (For Concrete)	Depth (Ins.)	Kind	Depth (Ins.)	Kind of Filler Used	Length of Guarantee Period (Years)
Illinois.							
Chicago	Concrete	1.3:6	6	....	..	......	.....
East St. Louis	Concrete	1:3:6	6-8	....	..	......	.....
Peoria	Concrete	1:3:5	5	Sand	2	Grout	2
Indiana.							
Fort Wayne	Concrete	1:3:6	6	Sand	2	Grout	5
Indianapolis	Concrete	1:3:5	6	Sand	2	Grout	5
Terre Haute	Concrete	1:6	..	....	..	......	.....
Iowa.							
Des Moines	Concrete	1:3:6	5-6	Sand	1½	Cement	5
Kentucky.							
Louisville	Concrete	1:3:6	6	Sand	1½	Grout	5
Maryland.							
Baltimore	Concrete	1:3:6	6	Sand	1-2	Cement	5
Massachusetts.							
Boston	Concrete	1:3:7	6	Sand	1	......	5
Springfield	Concrete	1:3:6	5	Sand	1	Sand-Pitch-Cem.	.....
Worcester	Concrete	1:3.6	5	Sand	1	......	.....
Michigan.							
Detroit	Concrete	1:3:6	6	Sand	1	......	None
Grand Rapids	Concrete	1:3½:7	[illegible]	Sand	1½	Grout	5
Minnesota.							
Duluth	Concrete	1:1½:3 1:2½:4	4	Sand	1½	Grout	3
Minneapolis	Concrete	1.2:5	5	Sand	½	......	1
Missouri.							
Kansas City	Concrete	1:3:6	6-8	Sand	1	Bitumen	5
St. Louis	Concrete	1:3:6	5	Mortar	½-1	Cement	1
New Jersey.							
Bayonne	Concrete	1:3:6	5	Sand	2	Grout	5
Jersey City	Concrete	1:3:6	6	....	..	......	5
Newark	Concrete	....	8	Sand	1½	Grout	5
Trenton	......	....	..	....	...	Grout	1
New York.							
Albany	Concrete	1:3.6	6	Sand	1½	Grout	5
Buffalo	Concrete	1- 8 1-10	6(a)	Sand	1½	Grout Bitumen	10
New York—							
Borough of Brooklyn	Concrete	1:3:6	..	....	..	......	.....
Borough of Queens	Concrete	1:3:6	4½-6	Sand	1½	Grout	.....
Borough of Richmond	Concrete	1:3:6 1:6(b)	6	Sand	1½	Grout	.....
Schenectady	Concrete	1:3:6	8	Sand	1½	Grout	5
Syracuse	Concrete	1:3:6	6	Sand	1½	Grout	2
Troy	Concrete	1:3:6	6	Sand	1	Grout	5
Ohio.							
Akron	Concrete	1:3:5	4-6	Sand	1	Grout Pitch	2
Cincinnati	Concrete	1:3:6	6	Sand	1½	Grout Bitumen	2
Columbus	Concrete	1.2½:5	6	....	..	Grout	5
Dayton	Concrete	1:3:6	6	Sand	1	Grout	5
Toledo	Concrete	1:3½:6	6	Sand	1½	Asphalt	5
Oregon.							
Portland	Concrete	1:3:5	6	Mortar	1	Grout	10
Pennsylvania.							
Harrisburg	Concrete	1:2:6	6	Sand	2	Grout	5
Philadelphia	Concrete	1.3:6	6	Sand	1	Grout	5
Pittsburgh	Concrete	1:3:6	6	....	..	......	1
Reading	Concrete	1:3:6	6	Sand	1	Grout	1
Scranton	Concrete	1:3:6	6	....	..	......	.....
Wilkes-Barre	Concrete	1:3:6	6	Sand	2	Grout	5
South Carolina.							
Charleston	Sand	....	..	Sand	1	Sand	5
Tennessee.							
Nashville	Concrete	1:3.6	6	Sand	2	Grout	5
Texas.							
Dallas	Concrete	1:8	5-6	Mortar	¾	Bitumen	5
Fort Worth	Concrete	1:9	5	Sand	1½	Grout	1
Houston	Concrete	1:3:6	6	Sand	1	......	5
San Antonio	Concrete	1:3:6	5	Sand	1½	Asphalt	5
Virginia.							
Norfolk	Concrete	1:3:6	5	....	..	......	5
Washington.							
Spokane	Concrete	1.3:6	5	Sand	1½	Bitumen	.....
Tacoma	Concrete	1:3:6	6	Grout	..	......	.....
Wisconsin.							
Milwaukee	Concrete	1:3:6	4-6	Sand	2	Grout	5

(a) "6 and over;" (b) screenings.

TABLE VIII.—CONSTRUCTION DETAILS—CEMENT CONCRETE.

		Depth of Concrete (Ins.)			Proportions of Concrete		Transverse Expansion Joints			
City	Number of Courses	Bottom Course	Top Course	Total	Bottom Course	Top Course	Are Transverse Expansion Joints Used?	Distance Between Transverse Expansion Joints	With or Without Bituminous Topping?	Length of Guarantee Period (Years)
California.										
Los Angeles	1	..	..	5	1:2:3½	..	Yes	50	both	..
Connecticut.										
Bridgeport	1	..	..	6	1:2:4	..	....	..	without	10
Hartford	1	6	..	6	1:2:4	..	Yes	50	with	..
District of Columbia.										
Washington	1	6	..	6	1:3:7	..	Yes	42	with	5
Georgia.										
Savannah	1	..	..	6½	1:1½:3	..	....	..	without	..
Illinois.										
Peoria	1	..	..	6	1:2:3	..	Yes	30-40	without	2
Indiana.										
Fort Wayne	2	5	2	7	1:2:4	..	Yes	33	without	5
Indianapolis	2	6	2	8	(a)	..	Yes	30	without	5
South Bend	..	..	..	..	....	..	Yes	100	......	..
Iowa.										
Des Moines	1	..	..	8	1:2:3½	..	Yes	25	without	..

TABLE VIII—CONSTRUCTION DETAILS—CEMENT CONCRETE (Continued).

City	Number of Courses	Depth of Concrete (Ins.) Bottom Course	Top Course	Total	Proportions of Concrete Bottom Course	Top Course	Transverse Expansion Joints Are Transverse Expansion Joints Used?	Distance Between Transverse Expansion Joints	With or Without Bituminous Topping?	Length of Guarantee Period (Years)
Maine.										
Portland	..	..	6	..	....	..	Yes	...	with	5
Massachusetts.										
Boston	2	5	1	6	1:3:7	..	..	..	without	5
	1	5	..	5	1:2:5	..	..	..	with	5
Brockton	1	6	..	6	1:2:3	..	Yes	25	without	..
Fall River	..	6	..	..	....	..	No	..	without	5
Lynn	1	5-6	..	5-6	....	..	..	..	without	..
Springfield	..	[illegible]	..	..	....	..	Yes	Noon—Night	with	..
Worcester	1	..	..	6	....	..	No	..	both	..
Michigan.										
Detroit	2	5	2	7	1:3:6	..	..	..	without	..
	1	..	..	6	1:3:6	..	..	..	with	..
Grand Rapids	2	5½	1	6½	1:2½:5	..	(b)	50	without	5
Minnesota.										
St. Paul	1	7	..	7	1:2:3	..	..	..	without	1
Missouri.										
Kansas City	1	6-8	..	6-8	....	..	..	..	without	5
New Jersey.										
Bayonne	2	5	1	6	1:3:6	..	Yes	50	without	5
New York.										
Schenectady	1	7	..	7	1:2:4	..	Yes	..	without	3
Ohio.										
Cincinnati	1	7	..	7	1:1½:3	..	Yes	30	without	1
Dayton	1	6	..	6	....	..	Yes	30(c)	without	5
Toledo	1	7	..	7	....	..	Yes	35	both	5
Oregon.										
Portland	1	..	..	6	1:2:4	..	No	..	......	10
Pennsylvania.										
Philadelphia	1	..	..	[illegible]	....	..	Yes	30	both	[illegible]
Pittsburgh	..	..	..	..	....	..	Yes	30	......	..
Reading	2	5	1½	6½	1:2:4	1:1:1	Yes	20	without	1
Wilkes-Barre	..	..	..	..	....	..	Yes	40 ft	......	..
Tennessee.										
Memphis	1	6	..	6	1:2:4	..	Yes	30	without	..
					1:3:6	..	Yes	30	with	..
Texas.										
Dallas	1	5-6	..	5-6	1:5½	..	Yes	30	with	5
Houston	1	7	..	7	(d)	..	Yes	30	without	5
San Antonio	2	..	..	5½-6	....	..	Yes	20	without	5
	2	3	2½	5½	....	..	Yes	20	with	5
Utah.										
Salt Lake City	2	5	2	7	1:2:4	..	Yes	30	without	5
Washington.										
Seattle	2	4	1½	5½	1:3:6	..	Yes	200	without	..

(a) reinforcement between courses; (b) on reinforced pavements; (c) protected joints 30 ft. apart on street pavements; unprotected joints 15 ft. apart on alley pavements; (d) no concrete pavements have been laid under the supervision of the Street Department, the work reported on was done privately.

TABLE IX.—CONSTRUCTION DETAILS—STONE BLOCK.

City.	Foundation. Kind.	Proportions (For concrete).	Depth (Ins.)	Bed. Kind.	Depth (Ins.)	Wearing Surface. Kind of Filler Used.	Length of Guarantee Period (Years).
Los Angeles, Cal.	Concrete	1:3:6	5	Sand	2	Gravel and Bit. Cem.	..
San Francisco, Cal.	Sand Concrete	...... 1:2½:7	5 6	Sand	1½	Cement Asphaltum Gravel	None
Bridgeport, Conn.	Concrete	1:3:6	6	Sand	1½	Cement	5
Hartford, Conn.	Concrete	1:3:6	6	Sand	1½	Grout	1
New Haven, Conn.	Concrete	1:3:6	6	Sand	2	Grout	[illegible]
Chicago, Ill.	Concrete	1:3:6	6	Sand	[illegible]	Pitch	..
Louisville, Ky.	Concrete	1:3:6	6	Sand	1	Grout	5
Portland, Me.	Gravel	......	..	Sand	1½	Grout	..
Baltimore, Md.	Concrete	......	..	Sand	2	Cement Asphalt	5
Boston, Mass.	Concrete	1:3:7	6	Sand	2	Pitch & Pebbles Grout	
Brockton, Mass.	Concrete	1:2½:5	4	Sand	[illegible]	Grout	..
Cambridge, Mass.	Concrete	......	5-6	Sand	1½	Grout	..
Fall River, Mass.	Concrete	......	4	Sand	1-2	Cement	5
Lawrence, Mass.	Earth	......	..	Sand	2	Grout	..
Lowell, Mass.	Concrete	1:3:10	6	Sand	2	Grout	..
Lynn, Mass.	......	......	..	Sand	1	Pitch Grout	..
New Bedford, Mass.	Concrete	1:3:5	6	Sand	1	Grout	..
Springfield, Mass.	Concrete	1:3:6	5	Sand	1½	Grout	..
Minneapolis, Minn.	Concrete	1:2:5	5	Sand	1	......	1
Kansas City, Mo.	Concrete	1:3:6	8	Mortar	..	......	5
Bayonne, N. J.	Concrete	1:3:6	5-6	Sand	1½	Grout	1
Camden, N. J.	Concrete	1:3:6	6	Sand	1½	Grout	1
Elizabeth, N. J.	Concrete	1:3:6	[illegible]	Sand	1½	Grout	3
Jersey City, N. J.	Concrete	1:3:6	6	Sand	2	Grout	..
Newark, N. J.	Concrete Sand	......	..	Sand	2	Grout	5
Albany, N. Y.	Concrete	1:3:6	[illegible]	Sand	1½	Grout	5
Buffalo, N. Y.	Concrete	1-8 1-10	6(a)	Sand	2	Grout Bitumen	10
New York, N. Y.							
Boro. of Brooklyn	Concrete	1:3:6	[illegible]	Sand	1-2	(b)	1
" " Manhattan	Concrete	1:3:6	[illegible]	Sand	1	Asphalt and Sand	1
" " Queens	Concrete	1:3:6	6	Sand	[illegible]	Bitumen Grout	1
" " Richmond	Concrete	1:3:6	6-8	Sand	1½	Grout	1
" " The Bronx	Concrete	1:3:6	6	Sand	1½	Cement and Sand	1

TABLE IX.—CONSTRUCTION DETAILS—STONE BLOCK (Continued).

	Foundation.			Bed.		Wearing Surface.	
City.	Kind.	Proportions (For concrete).	Depth (Ins.)	Kind.	Depth (Ins.)	Kind of Filler Used.	Length of Guarantee Period (Years).
Schenectady, N. Y.	Concrete	1:3:6	6	....	..	Grout	..
Syracuse, N. Y.	Concrete	1:3:6	6	Sand	2	Grout	2
Troy, N. Y.	Concrete	1:3:6	6	Sand	2	Grout	5
Cincinnati, O.	Concrete	1:3:6	6-8	Sand	1½	Pitch Grout	2
Columbus, O.	Concrete	1:2½:5	6	....	..	Grout	5
Toledo, O.	Concrete	1:3½:6	6	Sand	3	(c)	5
Portland, Ore.	Concrete	1:3:5	6	Mortar	1	Grout	15
Philadelphia, Pa.	Concrete	1:3:6	6	Sand	1½	Grout Coal Tar Pitch Asphalt & Filler	5
Pittsburgh, Pa.	Concrete	1.3:6	6	Sand	2½	Grout	..
Reading, Pa.	Earth subgrade	......	..	Screenings	2	Grout	..
Wilkes-Barre, Pa.	Concrete	1:3:6	6	Sand	2	Grout	5
Providence, R. I.	Concrete	1:3:6	6	Sand	1	......	..
Charleston, S. C.	Sand	......	...	....	..	Sand	..
Nashville, Tenn.	Concrete	1:3:6	5	Sand	2	Grout	..
Seattle, Wash.	Concrete	1:3:6	5-6	Sand-Cement	2	Grout	..
Milwaukee, Wis.	Concrete	1:3:6	6	Sand	2	Grout	..

(a) "6 and over"; (b) sand; grout; tar and gravel; tar and sand; (c) ½ sand, ½ asphalt.

TABLE X—CONSTRUCTION DETAILS—WOOD BLOCK.

	Foundation.			Bed.		Wearing Surface.	
City.	Kind.	Proportions (For concrete).	Depth (Ins.)	Kind.	Depth (Ins.)	Kind of Filler Used.	Length of Guarantee Period (Years).
Bridgeport, Conn.	Concrete	1:3:6	6	Sand	1	Sand	[illegible]
New Haven, Conn.	......	......	..	Sand	1	Sand	5
Chicago, Ill.	Concrete	1:3:6	6	Sand	1-2	Pitch	..
Indianapolis, Ind.	Concrete (a)	1:3:5	[illegible]	Sand	1	Asphalt	5
Terre Haute, Ind.	Concrete	1:6	..	....	..	......	..
Des Moines, Ia.	Concrete	1:3:6	5-6	Sand	1	Pitch and Sand	7
Louisville, Ky.	Concrete	1:3:6	6	Mortar	½	Sand	[illegible]
New Orleans, La.	Concrete	1:2:4½	6	Sand	1	Coal tar	[illegible]
Baltimore, Md.	Concrete	......	6	Sand	1-2	Asphalt	5
Boston, Mass.	Concrete	1:3:7	6	Sand	½	Sand	5
Cambridge, Mass.	Concrete	......	5	Sand	1	(b)	..
New Bedford, Mass.	Concrete	1:3:5	6	Sand	½-1	Sand	..
Springfield, Mass.	Concrete	1:3:6	5	Sand	½	Sand	..
Worcester, Mass.	Concrete	1:3:6	5	Sand	1	Sand	..
Detroit, Mich.	Concrete	1:3:6	6	Sand	1	......	None
Grand Rapids, Mich.	Concrete	1:3½:7	6	Sand	1½	Bit. Cement	5
Duluth, Minn.	......	......	..	....	..	Asphalt	[illegible]
Minneapolis, Minn.	Concrete	1:2:5	5	Sand	1	......	1
Kansas City, Mo.	Concrete	1:3:6	8	Mortar	..	......	5
St. Louis, Mo.	Concrete	1:3:6	5	Mortar	½-1	Asphalt Tar	1
Bayonne, N. J.	Concrete	1:3:6	[illegible]	Sand	1½	Bitumen	1
Newark, N. J.	Concrete	......	6	Sand	1	Sand	5
New York, N. Y.							
Boro. of Brooklyn	Concrete	1:3:6	6	Mortar	½	Sand Pitch	5
" " Manhattan	Concrete	1:3:6	6	Sand	½	Asphalt	5
" " Queens	......	......	6	Mortar	½	Sand	5
" " Richmond	Concrete	1:3:6	6-8	Mortar	½	Sand	5
" " The Bronx	Concrete	1:3:6	6	Mortar	½	Sand	5
Schenectady, N. Y.	Concrete	1.3:6	6	....	..	Sand	..
Akron, O.	Concrete	1:3:5	4	Sand	1	Sand and Pitch	2
Cincinnati, O.	Concrete	1:3:6	6-8	Sand	1	Pitch	2
Dayton, O.	Concrete	1:3:6	6	Sand	1	Asphalt	5
Toledo, O.	Concrete	1:3½:6	7	Mortar	½	Sand	5
Portland, Ore.	Concrete	1:3:5	[illegible]	Mortar	1	......	15
Harrisburg, Pa.	Concrete	1:2:6	6	Sand	1	Tar	5
Philadelphia, Pa.	Concrete	1:3:6	6	Sand	1	Sand	5
Pittsburgh, Pa.	Concrete	1:3:6	6	....	..	......	5
Reading, Pa.	Concrete	1:3:6	6	Sand	1	Sand	1
Scranton, Pa.	Concrete	1:3:6	6	....	..	......	..
Providence, R. I.	Concrete	1:3:6	6	Sand	1	......	5
Charleston, S. C.	Concrete	1:3:6	4-6	....	..	Sand	..
Nashville, Tenn.	Concrete	1:3:6	5	Sand	½	Pitch	5
Dallas, Tex.	Concrete (b)	1:8	5-6	Mortar	½	Asphalt	5
Fort Worth, Tex.	Concrete	1.9	5	Sand	1	Sand	5
Houston, Tex.	Concrete	1:3:6	6	Mortar	½	Asphalt	5
San Antonio, Tex.	Concrete	1:3:6	5	....	..	Asphalt	5
Norfolk, Va.	Concrete	1:3:6	6	Cement	½	Cement	5
Seattle, Wash.	Concrete	1:3:6	5-6	....	..	Cement-sand	..
Spokane, Wash.	Concrete	1:3:6	5	Sand	¾	Bit. Cement	..
Milwaukee, Wis.	Concrete	1:3:6	6	Mortar	½	Pitch	..

(a) gravel concrete; (b) cement and sand.

Notes on Table XI.

(f) f. o. b.; (g) per gallon; (h) per hour; (s) per sq. yd.; (t) per ton; (w) per week.

(1) per ton, f. o. b. cars; (2) per sq. yd., laid; (3) 1915 prices; (4) per sq. yd., laid and grouted; (5) city, 8 hours; (6) per "load"; (7) in bank; (8) 8 and 9 for common labor; (9) f. o. b. cars; (10) 9 hours for teams; (11) on street; (12) paving gravel; (13) per cwt.; (14) granite and bowlder, $5.60; brick, $4.00; (15) $13.00 and up; (16) for 4-in. blocks; (17) at crusher; (18) at pit; (20) plus freight; (21) 4-in. and 6-in. blocks, respectively; (22) for roller man, 9; (23) California; (24) 9 for common laborer; (25) 9 for common laborers and pavers, 10 for roller men and double teams; (26) $1.50 pit run, $1.75 screened; (27) 9 for common laborer.

TABLE XI.—PREVAILING COSTS OF LABOR AND MATERIALS.

City	Labor					Materials							
											Paving Blocks		
	Common Labor (per day)	Paver (per day)	Roller Man (per day)	Double Team, with Driver (per day)	Working Day (hours)	Portland Cement (per bbl.)	Broken Stone (per cu. yd.)	Sand (per cu. yd.)	Gravel (per cu. yd.)	Asphalt (per ton)	Brick (per M.)	Stone (per M.)	Wood (per M.)
Los Angeles, Cal.	$2.00	$3.00	$4.00	$5.00	9	$2.10 (f)	$1.20(f)	$.70 (f)	$1.05 (f)	$8.00(f)	$25.00 (f)	$65.00(f)	$45.00 (f)
San Francisco, Cal.	3.00	6.00	6.00	6.00	8	2.40	1.00	.50	....	9.00	32.00	50.00	....
Bridgeport, Conn.	2.25	....	3.50	....	9	1.76	2.30(t)	.75	.75	....	....	....	....
Hartford, Conn.	2.00	4.00	4.00	6.00	10(5)	2.05	1.55	1.20	....	25.00±	....	7.00	....
New Haven, Conn.	2.75	3.50	....	6.00	10	2.25	1.25	1.25	....	18.00	....	....	....
Washington, D. C.	1.50	2.50	4.00	4.00	8	1.00	1.32(t)	.54(t)	.69(t)	15.00	22.50	....	....
Jacksonville, Fla.	.15(h)	.25(h)	.34(h)	4.50	9	1.68	2.50	1.00	2.50	....	27.00	....	....
Savannah, Ga.	1.50	2.50	3.00	5.00	9	1.84	2.08	.35	....	35.00	23.25	.98½ (s)	....
Chicago, Ill.	2.75	6.00	6.00	6.00	9	1.25	1.65	1.25	1.50	20.00	25.00	90.00	65.00
East St. Louis, Ill.	2.50	4.00	3.00	5.00	10	1.41	1.00	.80	1.00	....	.70(s)	2.20(s)	1.25(s)
Peoria, Ill.	2.00	3.50	5.50	6.00	9–10(25)	1.50	2.00	1.50	1.75	....	....	....	....
Fort Wayne, Ind.	2.50	3.00	3.50	5.00	10	1.30	1.52	1.25	1.25	21.75	21.50	....	....
South Bend, Ind.	2.50	4.50	3.00	5.00	10	1.75	...	1.00	1.25	20.00	20.00	...	1.75(s)
Terre Haute, Ind.	2.00	....	5.00	4.00	9–10	...	...	...	....	....	....	....	....
Louisville, Ky.	1.75	3.00	3.00	5.00	10	1.55	.90	.80	.80	19.00	17.50	67.00	1.30(y)
New Orleans, La.	1.75	3.00-5.00	3.50	5.00	10	...	...	1.25	1.60	....	....	....	....
Portland, Me.	2.00	3.50	3.00	5.00	9	1.85	2.04	1.00	1.00	....	24.00	50.00	....
Baltimore, Md.	1.75	4.50	3.50	5.00	8(24)	1.76	2.30	1.00	1.15	17.20	21.00-28.00	60.00	31.00-52.00
Boston, Mass.	2.50	5.00	3.50	6.00	8	1.50	1.25(t)	.98	1.00	18.00–27.00	40.00	65.00	58.00
Brockton, Mass.	2.50	4.00	....	5.50	8(6)	1.30	1.80	1.25	1.25	.13(9)	....	50.00	....
Cambridge, Mass.	2.50	4.00	....	6.00	8	1.10	1.40	1.00–1.20	1.00–1.20	....	....	....	....
Fall River, Mass.	2.40	4.00	3.00-3.25	6.00	8	1.89	1.70(t)	1.18–1.35	....	....	....	....	....
Lawrence, Mass. (3)	2.25	4.50	....	5.00	8	1.55	1.15(1)	1.00	1.25	....	....	1.48½–1.64	....
Lowell, Mass.	2.25	4.00	3.50	6.00	8	1.60	.75(tf)	.25(tf)	.20(tf)	....	....	4-in., 40.00 6-in., 60.00	....
Lynn, Mass.	2.50	2.90	....	5.25	9	1.74	1.00(t)	.70	1.00	....	....	1.47(s)	....
New Bedford, Mass.	2.25	3.00	3.50	4.50	8	1.47	1.40(t)	.83(t)	1.15(t)	....	....	1.70(s)	....
Somerville, Mass.	....	....	....	...	..	1.00	1.45(t)	.70	.70	....	14.00	....	....
Springfield, Mass.	2.25	0.22(4)	3.00	5.25	8	1.50	0.90(t)	1.10(6)	0.15(7)	14.75	33.00	1.64(s)	1.84(s)
Worcester, Mass.	2.00	4.00	3.20	5.00	8	1.49	1.25	1.50	.50	....	....	48.50–59.00(21)	....
Detroit, Mich.	2.25	3.50	4.00	4.80	8	1.40	1.10	1.15	1.25	28.02	20.65	1.88(s)	1.50(s)
Grand Rapids, Mich.	2.00	3.00–3.50	4.50	4.50	8	1.45	1.60(17)	.90(18)	1.00(18)	20.00	23.00(20)	....	....
Duluth, Minn.	2.24	....	....	6.00	8	1.50	1.35	.80	1.00	22.00	26.00	....	....
St. Paul, Minn.	2.25	3.50	5.00	6.00	10	1.75	2.00	1.25	1.75-2.00	17.50	1.06(s)	....	1.48(s)
St. Louis, Mo.	2.25	3.50	4.00	5.00	10	....	....	1.00-1.50	....	18.00-25.00	16.00-20.00	40.00-50.00	40.00-50.00
Omaha, Neb.	2.50	5.00	5.00	6.00	....	1.40	1.95	1.25	1.85	26.00	23.50	....	....
Bayonne, N. J.	.30(h)	4.50	4.50	6.00	8(8)	1.65	....	....	....	....	....	....	....
Camden, N. J.	1.75	3.50	4.00	6.00	10	1.70	1.00	0.50	....	....	....	75.00	....
Trenton, N. J.	2.00	4.00	4.00	6.00	8	1.80	1.25	0.85(9)	1.00(9)	....	26.00-30.00	70.00	....
Albany, N. Y.	2.00	5.00	5.40	6.00	8(10)	2.15	1.15	1.10	.20	18.00	1.15(s)	1.80(s)	2.00(s)
Buffalo, N. Y.	2.00	4.80	....	6.00	8	....	....	....	....	....	....	....	....
New York, N. Y.:													
Boro. of Brooklyn	.25(h)	.62½(h)	.62½(h)	6.00	8	2.00	2.25	1.00	1.25	20.00	15.00	80.00	35.00
Boro. of Manhattan	1.75	5.50	5.00	7.00	8	1.75	1.13	.54	....	17.42	....	2.30(s)	1.50(s)
Boro. of Queens	2.50	5.00	....	7.00	8	1.50	2.00	1.00	2.00	20.00	29.00	75.00	28.50
Boro. of Richmond	1.75	5.00	5.00	6.00	8	....	....	....	....	....	....	....	....
Boro. of The Bronx	2.50	5.00	5.00	6.00	8	1.68	1.59(11)	.91	1.37(12)	14.48	....	....	39.00
Schenectady, N. Y.	2.25	....	....	5.00	8	1.60	2.00	.90	1.00	....	....	....	....
Syracuse, N. Y.	1.75	4.00	4.00	....	8	1.84	1.50	1.25	1.50	20.00	26.00	....	....
Troy, N. Y.	2.00	4.00	3.00	....	8	1.10	1.60	.85	1.10	16.00	27.00	64.00	....
Utica, N. Y.	2.25	3.25	4.00	5.00	8	1.42	1.17(t)	.65(9)	....	....	....	....	....
Akron, O.	2.50	3.00	3.00	5.50	8	1.70	....	1.00	1.80	....	20.00	....	....
Cincinnati, O.	2.00	(14)	4.17	6.00	8	1.40	1.67	1.32	.90	22.00	18.00	1.20(s)	1.50(s)
Columbus, O.	2.25	3.00	21.00(w)	5.50	8	1.85	1.25	1.25	1.25	....	17.00	....	....
Dayton, O.	2.25	3.50	4.00	5.50	8	1.80-1.90	....	1.00	.75-100	....	....	....	....
Toledo, O.	2.50	4.00	5.00	5.50	9	1.30	1.24	.88	1.20	....	....	....	....
Oklahoma City, Okla.	2.00	2.25–3.00	3.50–5.00	4.00	8	1.89	1.55	1.50	....	32.00	12.50-18.00	....	....
Portland, Ore.	2.50	5.00	4.05	5.00	8(22)	2.00	1.30	.86	.86	10.50(23)	1.50(s)	1.60(s)	1.50(s)
Erie, Pa.	2.50	3.00	3.00	6.00	10	....	....	....	....	....	....	....	....
Philadelphia, Pa.	1.75–2.00	4.50	4.25	5.50	10	1.55	1.60	1.25	1.30	13.00	26.00	80.00	85.00
Scranton, Pa.	.20(h)	.30(h)	.40(h)	5.50	....	1.60	1.50	1.50	....	17.42	20.00-35.00	....	....
Wilkes-Barre, Pa.	1.75–2.00	....	....	4.50	9-10	1.40	1.35	1.35	....	....	22.50-32.50	40.00	....
Providence, R. I.	1.75	3.00	3.00	4.50	9	....	....	....	....	....	....	....	....
Charleston, S. C.	1.60	3.00	2.75	5.00	9	.32(13)	1.75(t)	1.25	....	....	....	....	....
Memphis, Tenn.	1.75	4.00	6.00	5.00	8	1.85	1.17	1.25	1.50-1.75(26)	20.00	22.50	....	1.35(s)
Nashville, Tenn.	1.50	3.50	3.50	3.50	10	2.00	1.50	1.35	1.10	21.00	40.00	....	1.40(s)
Dallas, Tex.	1.75	2.25–2.50	3.50	3.50-4.00	8	1.60	....	1.35	1.35	18.00	20.00	....	45.00
Fort Worth, Tex.	2.00	3.50–4.00	3.50–4.00	4.00	8	1.70	1.80	1.40	1.25	17.00-30.00	18.00-21.00	....	....
Houston, Tex.	2.00	3.00	4.00	4.50	8	1.60	2.75	1.15	2.65	30.00	....	....	1.45(s)
San Antonio, Tex.	1.50	5.00	4.00	3.00-3.50	8	1.60	1.70	.75	1.30	....	1.60(sf)	....	....
Salt Lake City, Utah	2.25	3.00	3.00	5.00	8	2.25	1.25	1.25	1.25	20.00	....	....	....
Norfolk, Va.	1.45	3.25	3.00–5.00	5.00	9	1.24	2.00	.85	1.50	13.00(15)	27.00	4.50(t)	2.00(s)(16)
Seattle, Wash.	2.75	6.00	4.00	6.00	8	2.00	.75	.75	.75	12.00	30.50	82.00	30.00
Spokane, Wash.	3.00	3.50–4.00	5.00	6.00	8	2.40	1.50	1.00	1.30	15.50	28.00	....	1.45(s)
Milwaukee, Wis.	2.70	5.00	5.40	5.00	8(27)	1.40	1.40	1.20	1.20	22.00	27.00	....	....

For footnotes see page 55.

LETTER TO THE EDITOR

Road Building Instruction at the A. and M. College of Texas

Editor, "Good Roads:"

In a recent issue (April 8) of "Good Roads" Mr. Ernest F. Ayres, in discussing the subject of good roads education, criticized the technical schools, and especially the agricultural and mechanical colleges, for their shortcomings in regard to giving instruction in highway work. At the end of his article Mr. Ayres summarized the various lines of activity which he believes should be undertaken by the colleges.

It may be of interest to readers of "Good Roads" to know that the Agricultural and Mechanical College of Texas has had a chair of highway engineering for the last six years and the duties of the highway engineering staff have included most of the activities suggested by Mr. Ayres. Using his headings the outline of this work is as follows:

Extension Work

(a) Research work.—The college has a fully equipped laboratory for testing non-bituminous road materials and makes such tests without charge. The Texas Engineering Experiment Station was established at the college in August, 1915, one of its objects being research work in connection with highway problems. During the next college year a bituminous materials laboratory will probably be installed, and an assistant professor of highway engineering has been appointed whose time will be devoted primarily to laboratory work.

(b) The County Judges' and Commissioners' Association, the Texas Good Roads Association, and the Texas Rural Mail Carriers' Association held a joint road convention at the college last August in connection with which there was a large exhibition of road materials and machinery. Road bulletins are sent to all county judges and commissioners.

(c) Numerous lectures on good roads are given before various organizations and in communities where bond issues are being considered. An associate professor devotes his entire time to this work and the work outlined under (f) and (g) below.

(d) Several demonstration roads have been built on the college campus and have been described in a bulletin.

(e) Seven road bulletins have been issued to date and two more are nearly ready to go to press. One of the first was on earth roads.

(f) The college has twelve road models and other exhibit material which is used on demonstration trains, at state and county fairs, etc. A room at the college is used as a permanent good roads exhibit room.

(g) At the request of local officials the college sends an engineer to give general advice on highway matters, but does not attempt to do the work which should be done by a regular employed engineer. (All members of the highway engineering staff have had several years' experience in actual road construction and maintenance.)

(h) Reading courses are offered and a regular correspondence course is at present under consideration.

College Work

(a) Lectures are given at an annual short course for road supervisors and during the annual farmers' short course.

(b) Lectures are given to the teachers at the summer school.

(c) A few lectures on highway work have been given to the agricultural students during the regular session.

(d) All the civil engineering students receive instruction along the lines indicated by Mr. Ayres under this head, i. e., in highway construction, contracts, etc.

From this outline it will be seen that this college does everything suggested by Mr. Ayres except in regard to commercial students, of whom we have none.

In addition, a regular undergraduate course in highway engineering is offered as an option in civil engineering. The special work in highway engineering begins in the second term of the junior year and includes the study of rural highways, pavements, bituminous materials, highway laws, economics and organization, design of road and street systems, sidewalks, curbs and gutters, street cleaning, highway bridges and culverts, and testing road materials. Occasional lectures are given by prominent practicing engineers who are specialists in the various lines of highway work.

R. L. MORRISON,
Professor of Highway Engineering,
A. and M. College of Texas.

College Station, Texas.

COMING MEETINGS

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 13-15.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

MEETING

American Society for Testing Materials

The annual meeting of the American Society for Testing Materials was held at Atlantic City, N. J., June 27, 28, 29 and 30.

A. A. Stevenson, Philadelphia, Pa., was elected President and S. S. Voorhees, Washington, D. C., Vice President. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., continues as Secretary. The following members of the Executive Committee were elected: W. H. Bassett, Bridgeport, Conn.; John Brunner, Chicago, Ill.; G. W. Thompson, Brooklyn, N. Y., and F. B. Turneaure, Madison, Wis.

Pennsylvania Good Roads Day Association

The Pennsylvania State-Wide Good Roads Day Association was formed at a meeting held at Harrisburg, Pa., on June 26. The following officers were elected: President, R. L. Munce, Canonsburg; Secretary, A. A. Purman, Waynesburg; Treasurer, W. H. H. Davis, West Chester.

The object of the organization is to arouse and sustain interest in the good roads movement, especially with regard to the observance of an annual state-wide good roads day, such as has been held in Pennsylvania in the past two years.

Addresses were made by Dr. W. D. Martin, Washington County, who was the originator of the good roads day idea in

Pennsylvania, C. E. Carothers, Deputy Secretary of Agriculture, and W. R. D. Hall, Statistician of the State Highway Department. A committee was appointed to draft a constitution and by-laws.

Central Florida Highway Association

The annual meeting of the Central Florida Highway Association was held at Orlando, Fla., June 22, with a good attendance.

Aside from the reading and discussion of reports of standing committees and the transaction of the regular order of business, the principal feature of the program was an address by W. F. Cocke, State Highway Engineer.

At the annual meeting of the Intermountain Good Roads Association, which was held at Ogden, Utah, June 13 and 14, it was decided to hold the 1917 convention at Pocatello, Idaho.

A meeting of the Lake County, Ill., Good Roads Association was held at Round Lake, Ill., on June 28. The program included an address by A. D. Gash., president of the Illinois State Highway Commission, and the following papers: "Preparation of Permanent Roads," George W. Quinlan, Engineer, Cook County, Ill., and "Good Roads and Bridges," William Bruffie, Chairman, Cook County Road and Bridge Committee.

BOOK NOTICE

THE ENGINEER IN WAR. By Maj. P. S. Bond, C. E., U. S. A., M. Am. Soc. C. E. Pocket size, flexible binding, 175 pp., 75 illustrations. McGraw-Hill Book Co., Inc., 239 W. 39th St., New York, N. Y. $1.50.

In this book the author has set forth the relation of engineering to the conduct of war with especial reference to the part the civil engineer can take. The subject-matter is presented under the following chapter headings: The Military Policy of the United States; General Duties of the Military Engineer and Economics of Military Engineering; Tools and Equipment Employed in Military Engineering; Stream Crossings; Military Roads; Field Fortification and Siege Operations; Military Demolitions; Military Reconnaissance, Sketching and Surveying; Military Sanitation; The Mobilization of Material Resources; How May the Engineers and Contractors of America Prepare to Meet the Military Obligations of Citizenship? The book also contains a bibliography, a glossary of terms and an index.

REPORTS

FIRST INTERNATIONAL ROAD CONGRESS, held under the auspices of the Worcester (Mass.) Chamber of Commerce, Worcester, Dec. 14-17, 1915. Proceedings; paper, 6¾x10¼ ins., 112 pp. and covers.

Included in the "Proceedings" are the various addresses and papers delivered at the congress and a stenographic report of the proceedings and discussions. The subject-matter is arranged chronologically and the report is well printed.

INDIANAPOLIS, IND., BOARD OF PARK COMMISSIONERS: 21st Annual Report, for the fiscal year ending Dec. 31, 1915; paper, 6x9 ins., 95 pp. and covers; illustrated, inset map and table.

In this report are included the report of the Board of Park Commissioners to the Mayor and the reports to the Board by the Executive Officer, in which are included the reports of those at the head of the various activities of the park administration. The report is printed in brown ink on paper of exceptional quality and is profusely illustrated by excellent half-tone reproductions of scenes in the city's parks. An inset map shows the present and proposed park and boulevard system.

SECOND NATIONAL CONFERENCE ON CONCRETE ROAD BUILDING, held at Chicago, Ill., Feb. 15-16, 1916; Proceedings; paper, 6x9 ins., 328 pp. and covers. Published under the direction of the Committee on Resolutions. Edited by the Secretary, 111 West Washington St., Chicago, Ill $1.00.

Included in the "Proceedings" are the following: List of officers of the conference; preface; summary of proceedings; recommended practice; addresses and papers presented; committee reports; list of participants; discussion on the report of the committee on resolutions; specifications for concrete roads, streets and alleys, and an index. The greater part of the book is taken up by the committee reports and the discussions upon them.

PERSONAL NOTES

W. P. Wood has resigned as City Engineer of Sumner, Wash.

W. A. Browning has been appointed City Engineer of the Highland Park suburb of Dallas, Tex.

Charles E. Hewes has been made City Manager of Alhambra, Cal., in addition to his duties as City Engineer.

Hamilton Flood, civil engineer and contractor, and the first city engineer of Quincy, Mass., died recently in that city.

John B. Yeon, County Road Master of Multnomah County, Ore., has been presented with a silver plaque in recognition of his services in connection with the construction of the Columbia River Highway.

Edgar K. Ruth has resigned as Assistant Engineer of the Department of Bridges and Viaducts, Cincinnati, O., to take effect September 1, when he will become assistant professor of engineering at the University of Cincinnati.

NEWS NOTES

Milwaukee County, Wis., has under construction 20 of the 30 miles of roads which it is proposed to build this season. The entire project will represent an outlay of about $600,000.

The Pike Road Commission of Bradley County, Tenn., has instituted the section system of road maintenance. Section foremen have been placed in charge of this work on the five pike roads in the county.

Portland Cement Concrete Pavements have recently been included as those that may be laid as preliminary pavements under certain conditions in New York City. The Board of Estimate and Apportionment has authorized the use of a 6-in. cement concrete pavement as a preliminary pavement on a road or street in an undeveloped district under such conditions as are prescribed by the Board for each particular case.

The Supervision of Minnesota Bridge Work during the present year will be handled by four division bridge engineers and eight bridge inspectors of the State Highway Department. According to a recent announcement in the "Minnesota Highway Journal," the commission's publication, first attention will be given to state aid bridge work, but as much time as possible will be devoted to county and township bridges. The appointing of local inspectors by the counties and townships has not always worked out satisfactorily, it is stated. Final examinations of bridges will be made by the commission and the county and township boards.

EQUIPMENT — TRADE — MATERIALS

Pneumatic Scarifier Attachment

A road scarifier designed especially for use in the maintenance of earth, gravel and macadam roads has recently been brought out. It is built for attachment to the Austin-Western road roller and is shown in the accompanying illustration.

Briefly described the machine consists of a cylinder, attached to the rear of the roller, which operates scarifier teeth set in a frame hung on the rear end of the roller frame.

The scarifier is driven by compressed air furnished by a two-cylinder compressor mounted over the roller engine. The compressor is driven by the crank shaft, through a pulley and belt. The compressor cylinders are 3 ins. in diameter and have a 3-in. stroke. The compressor will bring the pressure in the storage tanks, which are mounted at each side of the cylinder, up to 120 lbs. per sq. in. in a few minutes. The tanks are tested to 300 lbs., the working pressure being 120 lbs., and are provided with a safety valve and also with an automatic relief arrangement which cuts out the compressor when the pressure reaches a certain amount, thus saving power and needless wear.

The scarifier carries 7 double-ended tines, each of which is adjustable separately for wear and depth of cut. They are carried on a hinged frame with a road wheel at each end to act as a guide and to regulate the depth of cut. A steel yoke spans the frame and is attached to the piston by a connecting rod hinged at each end to relieve the piston and cylinder from the strain and vibration from the rooting action of the tines.

The scarifier is controlled by the roller operator, the controller device being placed conveniently near the steering wheel. In operation the air is let into the cylinder and the tines are forced into the road. The air pressure then automatically maintains the proper depth of cutting. The scarifier is raised from the work by letting in air at the other end of the cylinder, the amount of air required being one-half the volume needed to force the tines into the road. When not in use, the scarifier can be lifted up, the clearance above the ground in this position being 11 ins. The distance from out to out of the scarifier wheels is 71 ins., the diameter of the scarifier wheels 21 ins. and their faces 4 ins. The tines are spaced 9 ins., center to center.

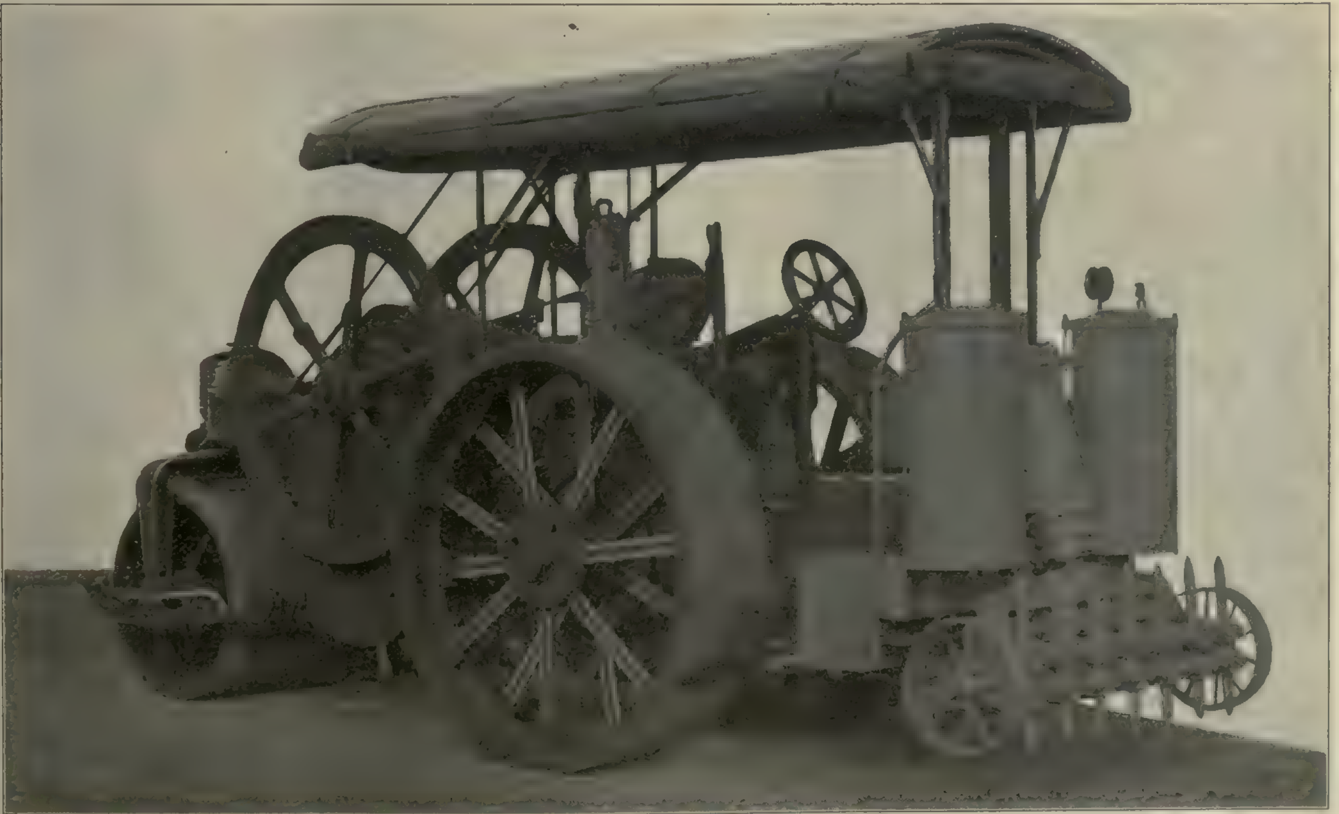
The scarifier is built by the Austin Manufacturing Co., Chicago, Ill., and can be attached to any 10 or 12-ton Austin motor roller.

Government Buys Russell Road Machinery for Use on Border

The government is using machinery manufactured by the Russell Grader Manufacturing Co., Minneapolis, Minn., for road construction on the Mexican border.

On May 24 the company received an order for two carloads of big machines consisting of the largest size elevating graders, Russell Mogul road machines with 12-ft. blades, and road plows. This order was particularly interesting in that it is said to be the largest express shipment of its kind ever moved from the Northwest. The total weight of the shipment was about 50,000 lbs. and the express charges amounted to $3,100.25. The entire shipment was under way within 48 hours of the receipt of the order. Recently the company received a supplementary order for three more elevating graders which have already gone forward.

Although the information has not been officially confirmed, it is understood that the machinery is to be used in rebuilding



AUSTIN PNEUMATIC SCARIFIER ATTACHED TO MOTOR ROLLER.

RUSSELL ROAD MACHINERY BEING LOADED FOR SHIPMENT TO THE BORDER.

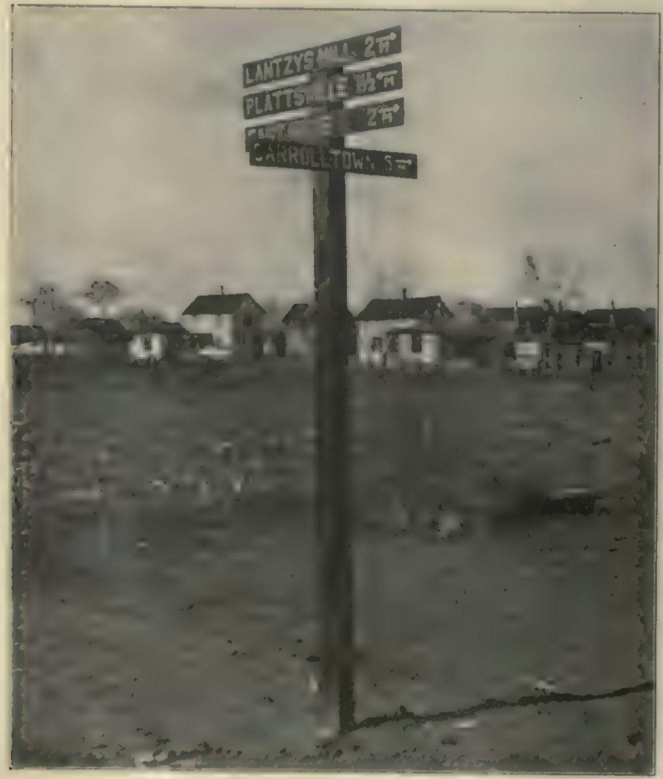
an old railroad right of way now used as a motor truck route to the army base at Casas Grandes.

Galion Metal Road and Street Signs

An all metal guide sign designed especially to overcome some of the objectionable features of the ordinary sign is shown in the accompanying illustration.

The sign consists of three sheets of metal, the front and back sheets being of galvanized sheet metal entirely covered with blank enamel, and the center sheet of aluminum. The letters, figures and other symbols are cut through the front sheet, thus allowing the white aluminum to show through. The sheets are fastened together by galvanized rivets and mounted on angle iron posts. The posts regularly furnished are 9 ft. long and of either 2½x2½-in. or 3x3-in. sections, each size being furnished in ¼-, 5/16-, or ⅜-in. metal.

The special advantage claimed for the sign is its durability. It is made entirely of metal, the enamel is baked on, and the method of outlining the letters overcomes the objection to letters which are riveted on and may be displaced, or letters which are painted and must be repainted at more or less frequent intervals.



GALION "EVERLASTING" GUIDE SIGN.

The sign is known as the Galion "Everlasting" road and street sign, and is manufactured by the Galion Iron Works & Manufacturing Co., Galion, Ohio.

Concrete Road Handbook Issued by Trussed Concrete Steel Company

The Kahn Road Book, a new handbook of 128 pages, has just been issued by the Trussed Concrete Steel Co., Detroit, Mich. It is devoted principally to illustrated information regarding concrete road construction.

The first part of the book contains a general historical review of concrete pavements, with detailed information regarding particular sections, such as Wayne County, Mich., and surrounding suburbs. The reports of road commissioners are quoted and tables are printed giving cost data as well as summary of yardage and mileage throughout the country.

The next section contains specifications for concrete highways and one and two-course concrete pavements together with diagrams of templates, bridges, etc. There is also interesting information regarding reinforcing and the use of expansion joints, curb bars and culverts and tables giving quantities of materials for concrete and mortar.

The book is issued primarily for engineers and contractors and will be sent on request.

TRADE NOTES

The America Dump Wagon Co., Cedar Rapids, Ia., has issued an illustrated folder describing the America dump wagon, patented by A. J. Koob. Charles P. Murray is manager of the company.

The Pittsburgh Testing Laboratory, Pittsburgh, Pa., has been retained for paving inspection service by Cleveland, O., Canton, O., South Bend, Ind., Newark, O., Park City, Tenn., Columbia, S. C., and Cuyahoga and Stark Counties, O.

The Chico Contracting Co. has been formed at Chico, Cal., to take over the business of the Chico Construction Co. C. E. Bennett is manager. The new concern will specialize on street and bridge work.

The Chain Belt Co., Milwaukee, Wis., has recently issued Bulletin No. 64 describing the Chain Belt traveling water screen for removing refuse from water used for industrial purposes. The bulletin is printed in two colors and illustrated.

The Asbestos Protected Metal Co., Pittsburgh, Pa., has issued a small booklet, printed in two colors and illustrated, describing the Pittsburgh paving joint. The illustrations include half-tone views of streets in which the joint is used and diagrams showing the various uses to which the material may be put.

Pike's Peak was recently climbed by a Model F motor truck manufactured by the International Harvester Co., of America, Chicago, Ill. An altitude of 12,000 ft. was attained, which is as far as the road is completed. The truck, which is a four-cylinder machine, equipped with internal gear drive and is owned by Harley McGregor of Colorado Springs, Colo., frequently traveled through snow 11 and 12 ins. deep, above the timber line.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. L.
New Series, Vol. XII.

NEW YORK, JULY 8, 1916

Number 2

Plans for $1,750,000 Road Expenditure in Sacramento County, California

The County Highway Commission of Sacramento County, Cal., has filed a report with the Board of Supervisors recommending the construction of fifteen highways, aggregating 124.07 miles, at an estimated cost of $1,750,000. The report suggests calling a special election to vote on the question of issuing bonds for the proposed work.

The highways covered by the report, together with the mileage and estimated cost of each, are shown in the following table:

Name of Road.	Length, Miles.	Estimated Cost.
Marysville	6.11	$92,772
H street	12.03	160,722
Fair Oaks-Greenback Lane	2.47	35,045
Greenback Lane	7.20	106,620
Plymouth	14.78	200,681
Florin-Upper Stockton	1.75	22,828
Florin-Perkins	3.66	46,478
Elk Grove-Franklin	3.33	40,541
Elk Grove-Sheldon	4.56	51,493
Lower Stockton	8.62	133,996
Galt-New Hope	7.40	100,712
Clay	9.25	64,938
Sacramento-Freeport	5.43	69,376
River	34.10	570,410
Pocket	3.38	53,388
Totals	124.07	$1,750,000

It is planned to have all of the roads constructed with concrete base of 4 ins. minimum. The surface will be of sheet asphalt or suitable asphaltic mixture in all cases except 7.34 miles of the Plymouth Road and 4.63 miles of the Clay Road, where a gravel surfacing is contemplated. Estimates are based on construction to a width of 15 ft. except on the Clay Road, which it is proposed to build to a width of 12 ft.

The construction of the River Road includes a draw or a bascule bridge, costing approximately $100,000, over the Sacramento River at Isleton. Incidental bridges and culverts on the various roads are to be of steel, reinforced concrete or corrugated iron pipe, as conditions may warrant.

Louisiana Considering Big Bond Issue for Road Construction

A bill known as the Alexander public highways bill, which carries a provision for a bond issue of $15,000,000, is being considered by a sub-committee of the Committee on Public Works, Lands and Levees of the Louisiana House of Representatives.

It is believed that the bill, as finally reported, will be amended so as to make it general to all parishes of the state. The understanding is that a section providing that parishes desiring to avail themselves of the benefits of the proposed law shall contribute one-quarter of the amount required for road construction will be eliminated, and that the bill will provide for the construction of a state-wide highway system; those parishes that already have improved roads to be reimbursed for such mileage as shall be taken into the proposed system.

Another amendment, which it is believed will be incorported in the final draft of the bill, is one which raises the amount of the proposed bond issue from $15,000,000 to $20,000,000.

The bill has the endorsement of numerous prominent citizens and organizations, among the latter being the New Orleans Association of Commerce.

California State Highway Commission Has Improved 1,484 Miles of Roads

According to a report of the California State Highway Commission, prepared in conjunction with an audit of the commission's finances, 1,484 miles of state highway have been improved under the state's $18,000,000 bond issue. Of this mileage 933 miles have been paved with concrete, 129 miles with oil macadam, 33 miles with asphalt and 395 miles have been graded. Approximately 2,280 miles have been surveyed as main trunk lines.

Since the commission started work, the report states, 11,750,000 cu. yds. of earth and rock have been moved at an average cost of 38 cts. per cu. yd., 8,750,000 sq. yds. of concrete pavement have been laid at an average cost of 74½ cts. per sq. yd., 143 grade crossings have been eliminated, and 443 bridges have been built with a valuation of $3,450,000.

Jefferson County, Alabama, Decides to Build Warrior River Roads

At a recent meeting of the Board of Revenue of Jefferson County, Ala., it was decided to construct what is known as the Warrior River Road from the river to Nichols' Fish Trap, where it will be joined by a road leading into the City of Birmingham. County warrants to the amount of $275,000 will be issued to cover the estimated cost of construction.

The board also decided to remove county convict road forces from other roads and put them to work on the construction of another route from the river, known as the Taylor's Ferry Road.

It is believed that the construction of the roads will be of great commercial benefit to Birmingham in the matter of enabling the city to secure lower freight rates for river transportation.

Landscape Survey of Roads Being Made in New York State

A survey of the roads of New York State is being made by H. R. Francis, Assistant Professor of Landscape Extension of the New York State College of Forestry, Syracuse, N. Y., for the purpose of gathering information regarding the possibilities of beautifying rural roads by planting trees and shrubs.

Prof. Francis is making his survey with the aid of an automobile and is submitting sketches and recommendations in furtherance of the plan to civic organizations in the various localities visited.

The chief objects of the survey are to ascertain the general conditions of highways in the matter of roadside trees and shrubbery. Such features are being taken into consideration as shrubbery, hedge rows, good and bad varieties of trees found along highways, views and vistas, the effect of shade trees on crops in adjacent fields, the possibility for the covering of bare embankments and the planting of some sort of vegetation where overhead wires are in large quantities. One of the principal objects to be studied is the condition of the roadbed as affected by the presence of trees.

According to a statement by Prof. Francis, the probable result of the survey will be that a system of roadside planting will be evolved which will make the roadways of New York State as important in scenic value as the roadbeds now are in accommodating traffic.

Illinois Highway Commission to Award Contracts for Road Work

The Illinois State Highway Commission has planned road construction in eleven counties of the state and will receive bids for the work on July 12. The work includes a trifle more than 22 miles and the estimated cost is $190,796.44.

Two of the contracts are for bridges and culverts. The following table gives details of the work, the estimated cost in each instance being exclusive of the cost of cement furnished by the state in all except the cases noted:

County	Type.	Length, Ft.	Estimated Cost.
Cass	Bituminous Macadam resurfacing and surface treatment	6,900	3,165.00*
Cass	Bituminous Macadam surface treatment	5,435	2,011.00*
Cass	Concrete	4,281	6,214.00
Cook	Brick	6,011.2	37,965.80
Cook	Concrete	9,364	20,151.80
Crawford	Concrete	2,200	7,154.70
Effingham	Earth	6,500	2,495.00*
Jefferson	Earth	15,700	8,064.48
Jersey	Oiled Earth	6,600	3,506.00*
Jersey	Six Bridges	......	3,875.00*
Jo Daviess	Concrete	2,525	4,814.36
Jo Daviess	Earth and Concrete	3,550	5,144.00
Kane	Concrete	15,500	31,187.08
Kane	Concrete	†20,568.6	45,456.56
Massac	Earth	5,370	2,972.00*
Monroe	Concrete	1,575	2,153.62
Monroe	Earth	5,052	2,663.00*
Pope	12 Culverts	......	1,803.00*
Total		117,131.8	$190,796.44

*No cement furnished by the state.
†Alternate bids must be submitted for both contracts.

Proposed Bridge Over San Francisco Bay Would Cost $22,000,000

Further details regarding the proposed bridge across San Francisco Bay, from the City of San Francisco, Cal. to Oakland, make it apparent that the structure would cost approximately $22,000,000. According to a statement by one of the engineers who was associated in the work of preparing the plans, the bridge would be one of the greatest, if not the greatest ever built.

As noted briefly in the issue of "Good Roads" for April 15, the proposed bridge would be approximately four miles long, with an average height of 30 ft. above the surface of the water. It is intended that there shall be four railway tracks and two driveways, one for motor vehicles and the other for slower moving conveyances. Three engineering firms were associated in the preparation of the plans, Harlan D. Miller, New York, N. Y., the Wilbur J. Watson Co., Cleveland, O. and William Russell Davis, Albany, N. Y.

It is planned to have the San Francisco terminal for vehicles at 2nd and Townsend Streets and the terminal for electric trains at 3rd and Market Streets. The Oakland terminal would be at 1st and Adeline Streets.

Ample provision for the passage of ships is provided in the plans by means of lift spans. The average depth of water under the structure would be 30 ft., with a maximum of 60 ft. at the deepest point. In the preparations of the plans and detail drawings, the work was divided up among the engineers engaged, so that each figured on only one class of work.

In regard to the financing of the construction, it is planned to have the counties of San Francisco and Alameda jointly build the bridge and charge a toll for crossing. It is estimated that the revenue thus derived would more than pay the interest on the cost of the structure, so that there would be no increased taxation.

Paving Work During 1916 in the City of Portland, Oregon

According to a statement furnished by Philip H. Dater, City Engineer of Portland, Ore., about 10.13 miles of pavement will be laid in Portland during the current year. This mileage, which includes pavements already laid and to be laid during the remainder of the year, is divided as follows:

Kind of Pavement.	Miles.	Estimated cost including foundation but not grading.
Asphaltic concrete	1.36	$30,000
Bitulithic	4.41	116,000
Bitulithic redress	1.09	27,100
Brick	0.33	14,000
Concrete	1.87	38,750
Gravel bitulithic	0.06	1,200
Hassam	0.46	10,000
Stone Block	0.55	39,000
Total	10.13	$276,050

It is stated that while this is the best information at present available, it is impossible to give exact figures on account of the methods of bringing about improvements. Street improvement proceedings are being initiated at all times during the year, and as the property owners to be assessed for the work may not agree on the improvements, results cannot be foretold.

Frank B. Black Appointed State Highway Commissioner of Pennsylvania

Governor Brumbaugh of Pennsylvania has announced the appointment of Frank B. Black, of Garrett, Pa., as State Highway Commissioner to fill the vacancy caused by the death of Robert J. Cunningham.

Commissioner Black took office on July 5. He has announced his intention of following the policy inaugurated by his predecessor in office. Previous to his appointment, Commissioner Black was a member of the recently created Pennsylvania State Agricultural Commission.

NEWS NOTES

The Forces of the Pennsylvania State Highway Department are working on the roads in and about Mt. Gretna, Pa., where the Pennsylvania state troops are mobilized. The department has no highways at the camp, but the work is being done by direction of Governor Brumbaugh.

A Summary of the Report of the U. S. Geological Survey for the first six months of 1916 contains the following: "The Portland cement industry has had a busy six months and the manufacturers are optimistic. It is predicted that in both production and shipments of cement this year will show a gain over last year, if indeed it does not establish a new record for cement."

The Board of Supervisors of Kern County, Cal., has declared that part of the proposed new road to Mt. Whitney lying within the county to be a public highway. This action is the formal procedure in establishing the highway. Plans and specifications for the construction of the road will be prepared as the next step. Kern County's share of the cost of construction will be between $35,000 and $40,000.

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PUBLISHED WEEKLY BY
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E. L. Powers, Pres. and Treas. H. L. Powell, Sec'y.

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THE COST OF FEDERAL SUPERVISION

A step which we believe that engineers will agree is in the right direction was taken by the conferees from the House of Representatives and the Senate of the United States in their work on the so-called Bankhead Bill (H. R. 7617), providing for federal aid. As noted in previous issues of "Good Roads" this bill was passed by the House and then by the Senate after the latter body had very extensively amended it. The text of the bill as passed by the Senate was printed in "Good Roads" for June 3.

Section 4 of the bill provided "that so much, not to exceed 5 per centum, of the appropriation of any fiscal year made by or under this Act as the Secretary of Agriculture may estimate to be necessary for administering the provisions of this Act, shall be deducted for that purpose, available until expended." This was reduced in the conference report to 3 per cent., and both the Senate and House have agreed to the bill as reported.

In a communication received some weeks ago, Major Crosby stated that in his opinion 5 per cent. was an unnecessarily large proportion to be set aside for the purpose of administration. He argued that it "might lead to gross extravagance in administration besides considerably reducing the amount to be actually available for physical work." He pointed out that the overhead charges for work done under the supervision of the State Roads Commission of Maryland during the years 1908 to 1911, inclusive, amounted to less than 5 per cent., although the administrative and executive work of that body was unusually thorough. He contended further that as the bill provided that the engineering work on roads built by national aid as well as the actual construction should be under the direct supervision of the state highway departments the federal organization would therefore be "largely, if not wholly, relieved of the necessity for expenditures on these details." He expressed the belief that not over 2 per cent. would be needed and that possibly 1 per cent. would be adequate.

Although exact figures on the cost of overhead in road work are available in very few instances, it seems entirely reasonable from such information as is at hand that 5 per cent. of the total expenditure is not only ample but considerably more than is required for efficient and economical administration. It is difficult to see how any considerable amount of such work need to be done by the federal government since under the provision of the act the government's sole function would seem to be to ascertain that the funds received from the federal treasury are expended on work whose character corresponds with a standard to be fixed by the Department of Agriculture, leaving, as pointed out by Major Crosby, by far the larger part of the work of administration in the hands of the state officials. There would certainly be no reason for the duplication of this work.

Another consideration is that the power to withhold so large a percentage of the total funds for "administering" the law would make possible the building up of a vicious political machine through the patronage which it would afford to the party in power. Political expediency already overshadows good business and sound engineering in the provisions of the bill and everything possible should be done to reduce the opportunity for pork and patronage.

Cutting the amount for administrative purposes from 5 to 3 per cent., while a wise step, is not as great as might well have been taken. A further reduction to 2 per cent. as suggested by Major Crosby—perhaps even to 1 per cent.—would not militate against the efficient administration of the work by the government.

COMING MEETINGS

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

County Commissioners of Washington

The dates of the annual meeting of the Washington State Association of County Commissioners at Tacoma, Wash., have been changed to September 14, 15 and 16. The tentative program was published in the June 17 issue of "Good Roads," and since then the following subjects and speakers have been added:

"County Pavements," R. H. Thomson, consulting engineer, Seattle; "California State Highway Work," Austin B. Fletcher, State Highway Engineer of California; "Highways of the State of Oregon; Laws, Construction and Maintenance," John H. Lewis, State Highway Engineer of Oregon; "Location and Construction of State Roads; also Relation of Highway Commissioner's Office with County Commissioners in Matter of Permanent Highway Law," James Allen, State Highway Commissioner of Washington; "Maintenance of Earth and Graveled Roads," Prof. W. F. Allison, University of Washington; "Legislation Committee's Report on County Government Legislation, with Suggestions and Remarks Thereon," J. T. S. Lyle, Chairman, Legislative Committee, Washington State Association of County Commissioners.

The session on September 14 will be a joint meeting of the state associations of county commissioners, county engineers and city engineers.

Frank B. Cole, who will act as toastmaster at the annual banquet of the association, will have for his subject, "Is It Better for a County Commissioner to Have a Short Memory Than a Clear Conscience?"

Yosemite-to-the-Sea Road Meeting

As was noted in "Good Roads" for May 27, the annual meeting of the Yosemite-to-the-Sea Good Roads Association will be held at Pacific Grove, Cal., on Saturday, July 22.

In addition to Governor Hiram W. Johnson of California, who is expected to attend and deliver an address, it is understood that the following will be present at the meeting: Austin B. Fletcher, State Highway Engineer of California; H. A. French, Superintendent of the State Motor Vehicle Department; Joseph Desmond, of the Yosemite Park Service, and all of the members of the California State Highway Commission.

The executive committee in charge of the arrangements for the meeting is composed of the following members: L. A. Nares, Fresno, Chairman; Elmer E. Chase, Fresno; H. B. Stoddard, Merced; E. D. Heron, Los Banos; F. A. Martin, Gilroy; W. S. Orvis, Madera; R. H. McKaig, Pacific Grove, Secretary.

There will be a meeting of the Board of Directors of the Forrest Highway Association at Gadsden, Ala., July 18, for the purpose of electing officers and transacting other business of importance.

MEETINGS

North Carolina Good Roads Association

The North Carolina Good Roads Association, at its annual meeting held at Wrightsville Beach, Wilmington, N. C., June 21, 22 and 23, re-elected H. B. Varner, of Lexington, N. C., President, and Dr. Joseph Hyde Pratt, of Chapel Hill, Secretary-Treasurer. Miss H. M. Berry was re-elected Assistant Secretary. The following Vice Presidents were named, one from each congressional district of the state: First, D. J. Canfield; Second, W. T. Howard; Third, George C. Royal; Fourth, G. L. Jones; Fifth, W. C. Boren; Sixth, W. D. MacMillan, Jr.; Seventh, S. C. Hatch; Eighth, E. E. Gray; Ninth, A. M. McDonald; Tenth, F. Stikeleather.

Mayor Wright of Wrightsville Beach, Mayor Moore of Wilmington, and W. A. McGirt of the New Hanover County Board of Commissioners, welcomed the delegates. Responses were made by President Varner and Prof. W. C. Reddick, of the Agricultural and Mechanical College, Raleigh, N. C., who spoke in place of Lieut. Governor E. L. Daughteridge.

Addresses were made by Dr. H. M. Rowe, Baltimore, Md., President of the Automobile Association of America; D. M. Winslow, U. S. Office of Public Roads; Commissioner M. S. Willard, New Hanover County; Dr. Pratt, State Geologist; Dr. W. S. Rankin, Secretary, North Carolina State Board of Health; O. L. Evans, President, Virginia Road Builders' Association; Dr. C. P. Ambler, Asheville, N. C., and others.

Prizes were awarded in accordance with the plan noted in "Good Roads" for June 10. Cherokee County sent ten delegates, who traveled 450 miles, and was awarded the first prize, Swain and Sampson Counties were awarded second and third prizes, respectively. Prizes for the largest delegations from towns were awarded to Andrews, Bryson City and Albemarle in the order named. Awards for exhibits of photographs of road work, etc., were made to Lee, Guilford and Swain Counties. The Salemburg Women's Club received the prize for the largest delegation of women.

PERSONAL NOTES

W. P. Latham has resigned as Superintendent of Streets of Northampton, Mass.

T. E. Edminster has been appointed Engineer of Precinct No. 3 of Harris County, Tex.

Harry Hall, Deputy County Engineer of Pierce County, Wash., died recently at Tacoma, Wash.

F. C. Thorpe has been appointed Division Engineer in charge of road construction in Division No. 3, Vermilion County, Ill.

W. H. Pascoe, Road Superintendent of Lehigh and Northampton Counties, Pa., under the State Highway Commission, has resigned.

Melville H. James, Secretary of the William Penn Highway Association, has established headquarters in the Telegraph Building, Harrisburg, Pa.

R. E. Spear has resigned as Assistant City Engineer of Bartlesville, Okla., to take a position in the City Engineering Department of Flint, Mich.

G. E. Hill has been appointed City Engineer of Pasadena, Cal., vice John MacMillan, resigned. Mr. Hill was Assistant City Engineer for a number of years.

H. R. Hershey, Quarryville, Pa., has been appointed Road Superintendent of Lehigh and Northampton Counties, Pa., by the State Highway Commission, succeeding W. H. Pascoe, whose resignation is noted elsewhere in this column.

NEWS OF THE TRADE

The Lee Loader Co., Chicago, Ill., has issued a 16-page illustrated booklet describing the Lee loader and the Lee side and end dump bodies for motor trucks and trailers.

The Barber Asphalt Paving Co., Philadelphia, Pa., has recently issued a booklet of eight pages, printed in two colors and illustrated with halftones, detailing the merits of Trinidad lake asphalt.

The Ransome Concrete Machinery Co., Dunellen, N. J., has established a branch office at 12-18 South 12th Street, St. Louis, Mo., in charge of E. Gwynn Robinson. All types of the company's concrete mixers are on exhibition at the new branch.

The Peoria Metal Culvert Co., East Peoria, Ill., has issued a folder printed in two colors and illustrated, describing the Universal road finisher and other articles in the company's line including road drags and corrugated and cast iron culverts.

The Wisconsin district office of the T. L. Smith Co., Milwaukee, Wis., has been moved to 609 Wells Street, Milwaukee, where E. R. Marker, District Manager, is in charge. A complete line of the company's concrete mixers and contractors' supplies is shown at the new office.

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Bill for Federal Aid in Road Building Signed by President Wilson

The conference bill providing $85,000,000 for federal aid in the construction of rural roads, as finally passed by both houses of Congress, was signed by President Wilson on July 11 and, according to the enacting clause, became operative at once.

The law, which is entitled "An Act to provide that the United States shall aid the States in the construction of rural post roads and for other purposes," is printed in full below:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

"That the Secretary of Agriculture is authorized to coöperate with the States, through their respective State highway deparments, in the construction of rural post roads; but no money apportioned under this act to any State shall be expended therein until its legislature shall have assented to the provisions of this act, except that, until the final adjournment of the first regular session of the legislature held after the passage of this act, the assent of the governor of the State shall be sufficient. The Secretary of Agriculture and the State highway department of each State shall agree upon the roads to be constructed therein and the character and method of construction: Provided, That all roads constructed under the provisions of this act shall be free from tolls of all kinds.

"Sec. 2. That for the purpose of this act the term 'rural postroad' shall be construed to mean any public road over which the United States mails now are or may hereafter be transported, excluding every street and road in a place having a population, as shown by the latest available Federal census, of two thousand five hundred or more, except that portion of any street or road along which the houses average more than two hundred feet apart; the term 'State highway department' shall be construed to include any department of another name, or commission, or official or officials, of a State empowered, under its laws, to exercise the functions ordinarily exercised by a State highway department; the term 'construction' shall be construed to include reconstruction and improvement of roads; 'properly maintained' as used herein shall be construed to mean the making of needed repairs and the preservation of a reasonable smooth surface considering the type of the road; but shall not be held to include extraordinary repairs, nor reconstruction; necessary bridges and culverts shall be deemed parts of the respective roads covered by the provisions of this act.

"Sec. 3. That for the purpose of carrying out the provisions of this Act there is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the fiscal year ending June 30th, 1917, the sum of $5,000,000; for the fiscal year ending June 30th, 1918, the sum of $10,000,000; for the fiscal year ending June 30th, 1919, the sum of $15,000,000; for the fiscal year ending June 30th, 1920, the sum of $20,000,000; and for the fiscal year ending June 30th, 1921, the sum of $25,000,000. So much of the appropriation apportioned to any State for any fiscal year as remains unexpended at the close thereof shall be available for expenditure in that State until the close of the third fiscal year succeeding the close of the fiscal year for which such apportionment was made. Any amount apportioned under the provisions of this Act unexpended at the end of the period during which it is available for expenditure under the terms of this section shall be reapportioned, within sixty days thereafter, to all the States in the same manner and on the same basis, and certified to the Secretary of the Treasury and to the State highway departments and to the Governors of States having no State highway departments, in the same way as if it were being apportioned under this Act for the first time: Provided, That in States where the constitution prohibits the State from engaging in any work of internal improvements, then the amount of the appropriation under this Act apportioned to any such State shall be turned over to the highway department of the State or to the Governor of said State to be expended under the provisions of this Act and under the rules and regulations of the Department of Agriculture, when any number of counties in any such State shall appropriate or provide the proportion or share needed to be raised in order to entitle such State to its part of the appropriation apportioned under this Act.

"Sec. 4. That so much, not to exceed three per centum, of the appropriation for any fiscal year made by or under this Act as the Secretary of Agriculture may estimate to be necessary for administering the provisions of this Act shall be deducted for that purpose, available until expended. Within sixty days after the close of each fiscal year the Secretary of Agriculture shall determine what part if any of the sums theretofore deducted for administering the provisions of this Act will not be needed for that purpose and apportion such part, if any, for the fiscal year then current in the same manner and on the same basis, and certify it to the Secretary of the Treasury and to the State highway departments, and to the Governors of States having no State highway departments, in the same way as other amounts authorized by this Act to be apportioned among all the States for such current fiscal year. The Secretary of Agriculture, after making the deduction authorized by this section, shall apportion the remainder of the appropriation for each fiscal year among the several States in the following manner: One-third in the ratio which the area of each State bears to the total area of all the States; one-third in the ratio which the population of each State bears to the total population of all the States, as shown by the latest available Federal census; one-third in the ratio which the mileage of rural delivery routes and star routes in each State bears to the total mileage of rural delivery routes and star routes in all States, at the close of the next preceding fiscal year, as shown by the certificate of the Postmaster-General, which he is directed to make and furnish annually to the Secretary of Agriculture.

"Sec. 5. That within sixty days after the approval of this Act the Secretary of Agriculture shall certify to the Secretary of the Treasury and to each State highway department and to the Governor of each State having no State highway department the sum which he has estimated to be deducted for administering the provisions of this Act and the sum which he has apportioned to each State for the fiscal year ending June 30th, 1917, and on or before January 20 next preceding the commencement of each succeeding fiscal year shall make like certificates for such fiscal year.

"Sec. 6. That any State desiring to avail itself of the benefits of this Act shall, by its State highway department, submit to the Secretary of Agriculture project statements setting forth proposed construction of any rural post road or roads therein. If the Secretary of Agriculture approve a project, the State highway department shall furnish to him such surveys, plans, specifications and estimates therefor as he may require: Provided, however, That the Secretary of Agriculture shall approve only such projects as may be substantial in character and the expenditure of funds hereby authorized shall be applied only to such improvements. Items included for engineering, inspections, and unforeseen contingencies shall not exceed ten per centum of the total estimated cost of the work. If the Secretary of Agriculture approves the plans, specifications and estimates, he shall notify the State highway department and immediately certify this fact to the Secretary of the Treasury. The Secretary of the Treasury shall thereupon set aside the share of the United States payable under this Act on account of such project, which shall not exceed fifty per centum of the total estimated cost thereof. No payment of any money apportioned under this Act shall be made on any project until such statement of the project, and the plans, specifications, and estimates therefor, shall have been submitted to and approved by the Secretary of Agriculture.

"When the Secretary of Agriculture shall find that any project so approved by him has been constructed in compliance with said plans and specifications he shall cause to be paid to the proper authority of said State the amount set aside for said project: Provided, That the Secretary of Agriculture may, in his discretion, from time to time make payments on said construction as the same progresses, but these payments, including previous payments, if any, shall not be more than the United States' pro rata part of the value of the labor and materials which have been actually put into said construction in conformity to said plans and specifications; nor shall any such payment be in excess of $10,000 per mile, exclusive of the cost of bridges of more than twenty feet clear span. The construction work and labor in each State shall be done in accordance with its laws, and under the direct supervision of the State highway department, subject to the inspection and approval of the Secretary of Agriculture and in accordance with the rules and regulations made pursuant to this act.

"The Secretary of Agriculture and the State highway department of each State may jointly determine at what times, and in what amounts, payments, as work progresses, shall be made under this act. Such payments shall be made by the Secretary of the Treasury, on warrants drawn by the Secretary of Agriculture, to such official, or officials, or depository, as may be designated by the State highway department and authorized under the laws of the State to receive public funds of the State or county.

"Sec. 7. To maintain the roads constructed under the provisions of this act shall be the duty of the States, or their civil subdivisions, according to the laws of the several States. If at any time the Secretary of Agriculture shall find that any road in any State constructed under the provisions of this act is not being properly maintained he shall give notice of such fact to the highway department of such State, and if within four months from the receipt of said notice said road has not been put in a proper condition of maintenance then the Secretary of Agriculture shall thereafter refuse to approve any project for road construction in said State, or the civil subdivision thereof, as the fact may be, whose duty it is to maintain said road until it has been put in a condition of proper maintenance.

"Sec. 8. That there is hereby appropriated and made available until expended, out of any moneys in the National Treasury not otherwise appropriated, the sum of $1,000,000 for the fiscal year ending June 30th, 1917, and each fiscal year thereafter, up to and including the fiscal year ending June 30th, 1926, in all $10,000,000, to be available until expended under the supervision of the Secretary of Agriculture, upon request from the proper officers of the State, Territory or county for the survey, constructon and maintenance of roads and trails within or only partly within the national forests, when necessary for the use and development of resources upon which communities within and adjacent to the national forests are dependent: Provided, That the State, Territory or county shall enter into a co-operative agreement with the Secretary of Agriculture for the survey, construction and maintenance of such roads or trails upon a basis equitable to both the State, Territory or county, and the United States: And provided also, That the aggregate expenditures in any State, Territory or county shall not exceed ten per centum of the value, as determined by the Secretary of Agriculture, of the timber and forage resources which are or will be available for income upon the national forest lands within the respective county or counties wherein the roads or trails will be constructed; and the Secretary of Agriculture shall make annual report to Congress of the amounts expended hereunder.

"That immediately upon the execution of any cooperative agreement hereunder the Secretary of Agriculture shall notify the Secretary of the Treasury of the amount to be expended by the United States within or adjacent to any national forest thereunder, and beginning with the next fiscal year and each fiscal year thereafter the Secretary of the Treasury shall apply from any and all revenues from such forest ten per centum thereof to reimburse the United States for expenditures made under such agreement until the whole amount advanced under such agreement shall have been returned from the receipts from such national forest.

"Sec. 9. That out of the appropriation made by or under this act, the Secretary of Agriculture is authorized to employ such assistants, clerks, and other persons in the city of Washington and elsewhere, to be taken from the eligible lists of the Civil Service Commission, to rent buildings outside of the city of Washington, to purchase such supplies, material, equipment, office fixtures, and apparatus, and to incur such travel and other expense as he may deem necessary for carrying out the purpose of this act.

"Sec. 10. That the Secretary of Agriculture is authorized to make rules and regulations for carrying out the provisions of this Act.

"Sec. 11. That this Act shall be in force from the date of its passage."

Summit County, Ohio, will vote at the August primaries on the question of issuing $1,200,000 in bonds for the extension of North Main Street and the construction of the proposed North Hill viaduct.

In Hillsboro County, Florida, 490,896 sq. yds. of brick pavement have been put down, according to a recent report. The cost of the work, including grading and curbing, has been $980,514.

Consul Homer Breet, at La Guaira, Venezuela, reports that heretofore the policy of the Department of Public Works, in its road building operations, has been to use hand labor exclusively, in order to give employment to as many persons as possible. Recently, however, a number of wheeled scrapers were purchased in this country and, after an official test, the department announced that one man and a scraper accomplished the work of 20 men under the old methods.

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Rodman Wiley Appointed Kentucky State Road Commissioner

Rodman Wiley, who has been Chief Bridge Engineer of the Department of Roads of Kentucky, has been appointed State Commissioner of Roads by Governor Stanley to succeed Robert C. Terrell, who has held the office since its creation.

New York City Street Cleaning Department Aids in Epidemic Fight

The Street Cleaning Department of New York, N. Y., is playing an important part in the efforts being made to control the epidemic of infantile paralysis, which has assumed serious proportions in all boroughs of the city.

Streets are being flushed several times during the day and night and the flushing gangs are followed closely by sweepers and refuse carts. A dozen extra trucks have been sent through the congested districts, bearing placards advising the people to be prompt about placing refuse where it can be collected by the department's carts.

Following the example set by Commissioner John T. Fetherston, who was to have gone on vacation on Monday of this week, the employees of the department have agreed to postpone their vacations until the epidemic is under control.

Network of Highways Planned in Several Washington Counties

The construction of new highways and the linking up of a number of existing roads in a plan to form a network of highways in Lincoln, Spokane and Stevens Counties, Wash., is being agitated in the localities affected.

It is proposed to complete the road from Spokane along the Spokane River to Miles, to be known as the Northwest River Highway. This road is completed from Spokane to Long Lake and Little Falls, and from Miles and Fort Spokane to Detillion Bridge and River Homes. A connecting link from Little Falls, on the north side of the river to Detillion Bridge, through Stevens County and the former Spokane Indian Reservation, or from Little Falls to River Homes along the south bank of the river in Lincoln County would complete the highway.

Connections would be made with Springdale at Long Lake following the Chamokane Valley, and with Wellpinit and Deer Trail at Little Falls. The Sunset Highway could be reached at Reardan either from Long Lake or Little Falls, and Davenport could be reached from Mill Canyon. A direct route would be established from Spokane to Fruitland, Hunter, Deer Trail and the Spokane reservation mines at Detillion Bridge.

Commissioner Black Stops Motor Racing on Pennsylvania Highways

Decisive action has been taken by State Highway Commissioner Black of Pennsylvania, to enforce a ruling made by the late Highway Commissioner Cunningham, prohibiting the use of Pennsylvania state highways for automobile races and hill-climbing contests.

In order to prevent a hill-climbing contest arranged to be held in the mountains near Uniontown in Fayette County, Commissioner Black has requested Major John C. Groom, Superintendent of the Pennsylvania State Police, to furnish a detail of men to see that the contest does not take place.

The State Highway Department takes the stand that automobile speed and hill-climbing contests not only damage the state highways, but interfere seriously with regular traffic.

Additional Road Work to Be Awarded by Illinois Highway Commission

Additional highway construction, aggregating about 20 miles at an estimated cost of $111,258.50, will be awarded July 19 by the Illinois State Highway Commission.

The work is located in six different counties and includes incidental bridges and culverts. The type of construction, length and estimated cost of each of the highways is shown in the following table:

County.	Type.	Length, Ft.	Est. Cost.
Bureau	Concrete	1,950	$4,959.84
Bureau	Concrete	2,258	4,685.60
Bureau	Concrete	2,350	4,600.16
Bureau	Concrete	2,175	4,805.88
Bureau	Concrete	2,436.5	4,613.20
Bureau	Concrete	2,500	4,570.84
Marion	Earth	22,460	10,601.64
Menard	Concrete	1,400	5,266.80
Rock Island	Gravel	5,300	*5,322.00
Rock Island	Gravel	3,000	6,424.42
Morgan	Oiled earth	33,780	17,273.12
Lee	W. B. macadam	5,950	*9,960.00
Lee, alternate	Gravel	5,950	*7,921.00
Lee	W. B. macadam	6,300	*10,069.00
Lee, alternate	Gravel	6,300	*10,185.00
Total		104,109.5	$111,258.50

*No cement furnished by the state.

Boston, Massachusetts, to Spend $500,500 for Street Repairs

Following a recent conference between Mayor Curley and members of the City Council of Boston, Mass., the council approved the mayor's orders for street repairs involving the expenditure of $500,513.35.

It is understood that practically all of the appropriation is to be expended for granite block repaving. Mayor Curley submitted to the council the following tentative list of streets to be repaved, together with the amount it is proposed to expend on each:

Repair of existing noiseless streets, $40,000; rebates on artifical stone sidewalks, $20,000; Beach Street, $10,500; Haymarket Square, $30,000; Lincoln Street, $11,000; Canal Street, $5,600; Dorchester Avenue, $31,500; Charles Street, $20,800; Clinton Street, $11,300; Boylston Street, $6,800; Washington

Street, $8,900; Devonshire Street, $8,300; McKinley Square, $21,000; Cross Street, $10,000; Batterymarch Street, $4,500; Fulton Street, $10,000; Mercantile Street, $9,600; School Street, $5,400; Harrison Avenue, $20,000; Appleton Street, $14,000; Chandler Street, $7,200; West Canton Street, $5,000; West Broadway, South Boston, $22,500; streets around Massachusetts General Hospital, $19,300.

Mayor Curley has instructed Commissioner of Public Works Murphy to invite Paul Hannigan, former Superintendent of Streets of Lawrence, Mass., to act as consulting engineer and supervise the expenditure of the money, because of his extended experience with granite block paving.

Extensive Street Improvements Planned in Philadelphia, Pennsylvania

The Committee on Highways of the Philadelphia, Pa., Councils has submitted a plan for the widening of Delaware Avenue to 150 ft. from Fairmount Avenue to Poplar Street and to 140 ft. between Poplar and Laurel Streets. The projected improvement will cost approximately $338,000, according to estimates.

This improvement will give the city a continuous commercial thoroughfare of an average width of 150 ft. from Washington Avenue to Laurel Street, along the Delaware River waterfront, and will provide for the expansion of belt line railroad facilities.

In addition to the widening of Delaware Avenue, the committee has reported favorably a number of other measures of a similar character, the total estimated cost being about $1,000,000. The most important of these involves the widening of 13th Street between Chestnut and Clover Streets. The cost of the improvement is estimated at $250,000, but real estate operators state that this figure is too low.

COMING MEETINGS

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

PERSONAL NOTES

R. O. Walker has resigned as City Engineer of Tarpon Springs, Fla.

Calvin D. Sargent, Supervisor of Roads of Nutley, N. J., has resigned.

Roy Welsh has been appointed City Engineer of Centralia, Wash., to succeed Caleb Berry.

A. J. Grant has resigned as Principal Engineer on the Charlotte Bridge in Monroe County, N. Y.

A. J. Berry, County Engineer of Kitsap County, Wash., died recently at Bremerton, Wash. He was at one time, City Engineer of Bremerton.

O. C. Kulicka has been appointed Assistant Engineer of the road work being done in Washington County, Miss., under the $950,000 bond issue.

J. S. Allen, Greenville, Miss., has been appointed Chief Engineer in charge of 150 miles of road work, in Washington County, Miss. The estimated cost of the work is $950,000.

George P. Clay, Inspector for the Pennsylvania State Highway Department at Franklin, Pa., has been promoted to the superintendency of Erie County, vice L. E. Van Vleck, resigned.

Percy H. Wilson, consulting engineer, Philadelphia, Pa., has been retained by the Borough Council of Glen Ridge, N. J., to supervise the curbing and guttering with concrete of about 1.75 mile of Ridgewood Avenue.

Samuel Hill, former President of the American Road Builders' Association, has gone to Vladivostok, Siberia, according to report, where he will take charge of the Traffic Department of the Trans-Siberian Railway for the Russian Government.

B. B. Weinberg of the Pennsylvania State Highway Department forces, has been appointed Superintendent of Blair and Cambria Counties, Pa., to fill the vacanacy caused by the resignation of A. J. Fasenmyer, which was noted in the issue of "Good Roads" for June 24.

NEWS OF THE TRADE

A new post office, designated as Destrehan, La., has been established by the government on the property of the Mexican Petroleum Corporation.

Recently the County Commissioners of Allegheny County, Pa., awarded a contract to the Thomas Cronin Co., Pittsburgh, Pa., for 1.5 mile of Bitoslag pavement. This pavement, manufactured by the Bitoslag Paving Co., New York, N. Y., was originally laid in 1910 at McKeesport, Allegheny County, Pa., and the service it gave there and at Philadelphia, Pa., where a stretch was put down a year ago, was an important factor in enabling the County Commissioners to decide on this type, especially in view of the abundance of slag available in Allegheny County.

The Shawmut Paving Brick Works, Shawmut, Pa., and the Pennsylvania Clay Co., Pittsburgh, Pa., have become licensees of the Dunn Wire-Cut Lug Brick Co., Conneaut, Ohio. The Shawmut company has an approximate daily capacity of 30,000 paving brick, but the company is contemplating the enlargement of the plant to a 50,000 daily capacity. The Pennsylvania Clay Co. has a plant at Conway, Pa., with a capacity of 60,000; a plant at Crows Run, Pa., with a capacity of 60,000; and a plant at Brady's Run, Pa., with a capacity of 40,000. The acquisition of these two companies gives the Dunn Wire-Cut Lug Brick Co., 32 licensees, operating 52 plants.

Clay County, Mo., has voted to issue $1,250,000 worth of bonds for the purpose of constructing a system of highways aggregating 202 miles.

The Good Roads Association of Hunt County, Tex., wants an election called on the question of issuing bonds to the amount of $1,400,000 for road construction.

An Election Will Be Held in Humboldt County, Cal., August 29 on the question of issuing bonds to the amount of $1,500,000 for the construction and improvement of 293.5 miles of roads.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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NEW YORK, JULY 22, 1916

Number 4

New York City Street Cleaning Department Does Educational Work

In his annual report to Mayor Mitchel, Street Cleaning Commissioner John T. Fetherston of New York, N. Y., devotes considerable space to the educational work of the department, the object of which is to instruct the people in proper ways of disposing of their waste so that the department may most effectively perform its service; to cultivate a sentiment against littering the streets and to make all citizens realize that they should help to keep the city clean. A committee composed of representative citizens and known as an Advisory Council assists in this work by preparing and distributing literature and by making addreses to clubs and societies. Juvenile leagues, under the direction of a supervisor, who devotes all of his time to the work, is another channel through which the educational division extends its efforts. There are 400 of these leagues in the public schools of the city.

During 1915 there were 5,951 arrests of citizens for violations of ordinances relative to street littering and the disposal of waste, upon complaints made by members of the street cleaning force. Of those arrested, 4,759 were fined or received short sentences. The fines aggregated $5,025. In addition to the arrests, 38,520 warnings were served upon violators of the ordinances by the department.

While the amount of work done by the department, measured by the quantities of refuse handled and the increased area cleaned, was greater than in former years, the cost to the city was but slightly more than the lowest record made in recent years, and such increase as is shown is accounted for in the increased prices of forage and other supplies, due to the European war.

There was an increase of more than 30 per cent. in the area of streets flushed daily. A number of valuable additions to the plant of the department, including two covered dumps, are reported, as well as improvement in several article of equipment.

A section of the report is devoted to the so-called "Model District," which began to get under way in 1915. In equipping this district with auto tractors and trailers for collecting ashes, garbage and rubbish, and locomotive cranes at the district dumping pier, $112,122 was spent. There were 7,000 employes of the department at work in the year, 3,000 of whom were sweepers and 2,500 drivers.

An interesting analysis of the labor performed by each of the sweepers assumes that the sweepers are "municipal housekeepers," and states that each one of them "cleans house" several times a day after 1,805 persons, 37 horses and 23 automobiles.

The report shows that there was an increase in the number of automobiles in the Boroughs of Manhattan, Brooklyn and the Bronx in 1915 of 15,613, or 33 per cent. The number of horses was about the same as in the previous year. There was an addition of 9,362 to the number of buildings in the three boroughs. These figures are considered significant in view of the fact that the numerical strength of the department and the cost of its maintenance were about the same in 1915 as in 1914.

Fewer Horse Drawn Vehicles on Streets of Two Largest Cities

According to the National Automobile Chamber of Commerce, official records wherever obtainable, show that there is a falling off in the amount of horse drawn traffic and a more than corresponding increase in motor traffic on city streets.

Figures compiled by the Department of Public Works, New York, N. Y., made preparatory to widening and repaving city streets, show that on 5th Avenue at 42d Street, 91.5 per cent. of the traffic was motor vehicles and 8.5 per cent. was horse drawn. In the four years, from 1911 to 1915, the average number of horse drawn vehicles passing at three points on 5th Avenue between 8 A. M. and 6 P. M. in one day, between 33d and 59th Streets, decreased from 2,577 to 1,670, or 35 per cent., while the average number of motor vehicles increased from 7,202 to 12,893, or 79 per cent.

In 8th Avenue, where traffic is largely commercial, horse drawn vehicles increased slightly, from 4,528 in 1911, to 4,898 in 1915, and motor vehicles from 1,728 to 6,606. Motor trucks increased 500 per cent.

At Columbus Circle, where Broadway, 8th Avenue and 59th Street intersect, more than 67 per cent. of the traffic was motor driven. An average of counts made at several different locations, on 2nd, 5th and 8th Avenues, on Broadway at 163rd Street, and on Canal Street, shows more than 69 per cent. of the total traffic is by motor vehicles.

Records of the Chicago Bureau of Licenses show that the number of horse drawn vehicles in that city decreased from 58,114 in 1910-11 to 49,582 in 1915-16, and that motor vehicles, not including motorcycles, increased from 11,088 to 43,129 in the same period.

Examination for Position of Senior Highway Engineer

The United States Civil Service Commission announces an open competitive examination for senior highway engineer for the purpose of establishing an eligible list from which certifications will be made to fill vacancies in the Office of Public Roads and Rural Engineering, Department of Agriculture. The position pays from $2,200 to $4,000 a year, but only those obtaining a rating of 85 per cent. or over will be eligible for appointment to positions paying $3,000 or more.

Competitors will not be assembled for examination but will be rated on the following subjects, which will have the relative weights indicated: Education and preliminary training in engineering, 20; Responsible experience in engineering and fitness, 30; Responsible experience in highway engineering, 50. Applicants must be physically qualified for the work and must have reached their thirtieth birthday on the date of examination. They must have had not less than four years of preliminary engineering experience or must be graduates in engineering from a recognized college. They must have had not less than eight years of responsible engineering experience of which not less than five years must have been in responsible highway engineering.

The examination is open to all male citizens of the United

States who meet the requirements. Those who desire to take the examination should apply at once for Form 1312, stating the title of the examination, which is "United States Civil Service Examination, Senior Highway Engineer (Male), $2,200-$4,000, August 8, 1916." Forms may be obtained at any of the following places: United States Civil Service Commission, Washington, D. C.; Secretary, United States Civil Service Board, Postoffice, Boston, Mass., Philadelphia, Pa., Atlanta, Ga., Cincinnati, O., Chicago, Ill., St. Paul, Minn., Seattle, Wash., San Francisco, Cal., Custom House, New York, N. Y., New Orleans, La., Honolulu, Hawaii, Old Custom House, St. Louis, Mo., Administration Building, Balboa Heights, Canal Zone, or to the Chairman, Porto Rican Civil Service Commission, San Juan, P. R.

Applications must be filed with the United States Civil Service Commission at Washington, before the close of business on August 8 and must be accompanied by a medical certificate.

California Mountain Roads Being Built by Convict Forces

Under the law which became effective in August of last year, the California State Highway Commission has been employing convict labor on the construction of mountain roads with extremely satisfactory results.

The first camp, consisting of 30 men, was established in the northern part of Mendocino County last September. The scope of the work was gradually enlarged until two camps were running, with an aggregate of 125 men. The men worked every day except Sundays, under the direction of the State Highway Commission. There were three unarmed guards to each camp. The commission supplied everything necessary for the work and, during the winter, eight miles of difficult canyon road construction was completed for 25 per cent. less than the estimates.

The outcome of the work in Mendocino County led to the establishing of other camps and the commission is preparing to undertake four of the difficult Sierra laterals during the present season.

The convicts are permitted a large measure of personal freedom in camp and the law allows one day commutation of sentence for each two day's work.

Nashville, Tennessee, to Proceed with Paving Tied Up by Lawsuit

The Board of Commissioners of Nashville, Tenn., has authorized the Southern Bitulithic Co. and the Foy-Proctor Co. to proceed with the paving of certain streets under contracts awarded by the city under the abutting property tax law, in 1914 and 1915. The materials called for are bitulithic, bitustone, wood block, asphalt and tarvia.

Work under these contracts has been held up for a considerable length of time owing to a suit brought by B. M. Burns against the city. Burns was suspended from his duties in the Financial Department of the city as a result of the alleged loss of certain books and records. He secured a temporary injunction against his discharge. Some of the further results of his legal activities were the institution of a taxpayers' suit against the city in which the record amounts to about 8,000 pages, with the testimony not all in, the ousting of some of the city commissioners, the ordering by the lower court of a receiver for the city and the reversal of this order by the higher court, and the issuance of an injunction prohibiting the city paying any moneys on any contracts, especially paving contracts.

This naturally led to a suspension of work under the contracts referred to. The city employed special counsel who upheld the city attorney in his opinion that the contracts were perfectly legal and valid. Thereupon the Board of Commissioners ordered the work to proceed, with the stipulation that the contractors mentioned agreed not to hold the city liable for damages on account of the delay.

The agreement carries a further stipulation that the city shall pay the contractors in accordance with the terms of their contracts. The amounts to be paid to the Southern Bitulithic Co. and the Foy-Proctor Co. under the contracts for paving yet to be done are $84,820.88 and $153,633.45, respectively. The two concerns agree to withdraw suits brought by them against the city upon the assumption by the city of the cost of the action.

May Start Work This Season on Mount Hood Road in Oregon

Coincident with the approval of the federal aid bill by President Wilson, comes an announcement from Portland, Ore., that construction work on the proposed highway around Mount Hood may be started during the present season.

The road has been surveyed and its construction recommended by the Forest Service, but work has been held up owing to lack of available funds. Under the law only 10 per cent. of the amount received from the sale of standing timber may be used, and about $25,000 a year has been available in Oregon. This has been used on other roads. The estimated cost of the proposed road is $200,000, with about $25,000 each additional for two proposed branches. With funds available from the $10,000,000 appropriation for forest roads, it is believed there will be nothing to stand in the way of starting work this season and completing the road next year.

The surveyed route connects the Hood River Valley with the road at Government Camp. It is 26 miles long, with a maximum grade of 4 per cent. The two proposed branch roads would afford connection with existing roads running from The Dalles and from Dufur toward Mount Hood.

With the completion of the proposed link between the Hood River Valley and Government Camp, the circuit of Mount Hood would be complete. An automobile could travel from Portland over the Columbia River Highway to Hood River, thence south through the valley along the Hood River, thence over the proposed government link to Government Camp, and finally over the Barlow road and existing county roads, back to Portland. The entire distance is about 140 miles.

In regard to forest road work, the federal aid law, as printed in full, in the preceding issue of "Good Roads," provides that, upon request of the proper officers of the states or counties, the money shall be used for building roads and trails, upon which communities within or near the national forests are dependent. The work is to be done in cooperation with the various states and counties. Not more than 10 per cent. of the value of the timber and forage resources of the national forests within the respective county or counties in which the roads or trails will be constructed, may be spent. Provision is made for the return of the money to the national treasury by applying 10 per cent., of the annual receipts of the national forests in the state or county until the amount advanced is covered. The receipts from the national forests for the fiscal year ending June, 1916, were $2,820,000, or $341,000 more than during the previous fiscal year, according to the report of the Forest Service

Hopkins County, Tex., intends to construct 60 miles of roads with the proceeds of a bond issue of $400,000 which was voted recently.

Bridge Work at Chicago, Ill., is to be undertaken with the proceeds of a $5,100,000 bond issue voted last month. The program laid out comprises the building of many new structures for the replacement of existing bridges with center piers.

The Board of Governors of the Motor Club of Harrisburg, Pa., has passed resolutions expressing appreciation of the work of the Pennsylvania State Highway Department, as evidenced on a recent tour made by the club.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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Illinois Highway Commission Wants Bids for Road and Bridge Work

The Illinois State Highway Commission will receive bids next Wednesday for additional highway and bridge work, involving an estimated expenditure of $169,331.93. The work is located in five different counties and the road construction aggregates nearly 20 miles.

The type of construction, length and estimated cost of each of the items, together with the name of the county in which the work is located, are shown below:

County.	Type.	Length, Ft.	Estimated Cost.
Bond	Brick	3,300	$7,386.28
Hancock	Earth	7,400	3,798.70
Hancock	Earth	9,700	3,691.74
Hancock	Earth	7,100	2,668.30
Hancock	Earth	10,245	*2,776.00
Hardin	Bridge	.....	*1,495.00
LaSalle	Brick	5,280	17,975.70
LaSalle	Brick	4,900	21,658.80
LaSalle	W. B. macadam	10,560	17,303.20
LaSalle, Alternate	Gravel	10,560	14,789.20
LaSalle	Concrete	10,745	16,322.80
LaSalle	Concrete	5,280	9,275.30
Vermillion	Brick and W. B. macadam	18,158.2	50,160.91
	Total	103,228.2	$169,331.93

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*Indicates no cement furnished by state.

More Than $18,000,000 Derived From Motor Vehicle Licenses in 1915

Statistics compiled by the Division of Road Economics, United States Office of Public Roads and Rural Engineering of the Department of Agriculture, show that the gross revenue derived from motor vehicle registration and licenses during 1915 amounted to $18,245,713.09.

Of this amount $11,555,459.25 was available for road work under the direction of state highway departments or similar authority, and $4,657,929.39 under the direction of local authorities. The average gross revenue return per motor car registration was $7.46.

The following table shows the specific figures in each of the classifications mentioned above, for each state:

State	Gross Revenue	Available for Road Work		Aver. Per Car
		State Dept.	Local	
Alabama	$180,744.25	....	....	$15.53
Arizona	45,579.00	$45,579.00	....	5.88
Arkansas	80,551.00	40,105.00	$40,105.00	10.04
California	2,027,431.75	932,492.79	932,492.78	12.38
Colorado	120,800.70	55,581.37	55,581.37	4.18
Connecticut	536,970.09	521,854.57	....	13.05
Delaware	55,596.00	....	....	11.00
*Dist. of Col.	29,396.00	....	....	3.67
Florida	60,000.00	(a)	60,000.00	5.53
Georgia	125,000.00	....	110,000.00	5.00
Idaho	121,259.00	30,314.75	90,944.25	17.14
Illinois	924,905.74	924,905.74	....	5.11
Indiana	587,318.50	....	544,578.81	6.06
Iowa	1,533,053.82	122,644.31	1,303,095.75	10.56
Kansas	387,588.00	....	315,192.50	5.24
Kentucky	117,117.00	117,117.00	....	6.01
Louisiana	75,600.00	....	68,040.00	6.62
Maine	268,412.00	268,412.00	....	12.46
Maryland	386,565.13	351,485.02	....	12.45
Massachusetts	1,235,732.99	1,105,066.17	....	12.04
Michigan	373,833.10	....	....	3.25
†Minnesota	‡160,540.00	....	....	1.72
Mississippi	‡76,700.00	....	68,000.00	7.93
Missouri	323,289.30	323,289.30	....	4.23
Montana	33,120.00	31,120.00	....	2.27
Nebraska	‡183,000.00	....	‡161,000.00	3.10
Nevada	7,875.00	....	7,075.00	3.90
New Hampshire	257,776.00	236,118.67	....	17.28
New Jersey	1,062,922.96	§1,039,867.99	....	12.98
New Mexico	29,624.89	23,031.39	1,683.60	5.89
New York	1,991,181.00	1,934,360.00	....	7.80
North Carolina	123,000.00	....	98,400.00	5.86
North Dakota	79,245.00	....	71,434.45	3.18
Ohio	934,622.38	894,416.32	....	5.43
Oklahoma	154,892.00	154,892.00	....	6.18
Oregon	108,881.50	....	87,230.08	4.61
Pennsylvania	1,665,276.50	1,665,276.50	....	10.39
Rhode Island	206,440.00	200,284.00	....	12.62
South Carolina	‡15,000.00	....	....	(b)
South Dakota	‡180,000.00	....	‡157,000.00	6.27
Tennessee	‡34,000.00	14,219.17	....	4.46
Texas	‡20,000.00	....	....	(c)
Utah	(d)60,000.00	(e)35,000.00	....	6.54
Vermont	218,479.85	216,695.58	....	18.10
Virginia	176,875.14	170,646.62	....	8.28
Washington	238,717.50	....	168,117.00	6.14
Wisconsin	431,977.00	100,684.00	302,055.00	5.42
Wyoming	19,880.00	....	15,904.00	5.00
Total	$18,245,713.09	$11,555,459.26	$4,657,929.39	$7.46

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*Perennial registration.

†Triennial registration.

§Allotted to counties for maintenance under state dept.

‡Approximate.

(a) Law effective Oct. 1, 1915, provides 15% of revenue for maintenance of State Road Department.

(b) No state registration. Perennial county registration. Fee, $1.00.

(c) Same as above. Fee, 50 cts.

(d) Approximate. Law requiring annual registration in effect May 11, 1915.

(e) For first six months during which law was operative.

Pennsylvania Highway Department Receives Bids for Road Work

The Pennsylvania State Highway Department on Wednesday opened bids for the construction of roads in six counties, aggregating slightly more than 21 miles. These were the first bids for road construction which State Highway Commissioner Black has opened since assuming office.

Counties in which it is proposed to do the work, together with the name of the low bidder and other details, are given below. No awards will be made until the bids have been checked and scheduled.

Allegheny County, South Fayette Township, 16,852 ft., reinforced concrete: Low bidder, Monongahela Construction Co., Inc., Pittsburgh, $71,428.39.

Cambria County, Jackson and East Taylor Townships, 32,923 ft. brick on reinforced concrete base: Low bidder, John J. Elder, Ebensburg, $146,542.05.

Chester County, Penn, Upper and Lower Oxford Townships, 32,214 ft. reinforced concrete: Low bidder, Souder Construction Co., Inc., Lancaster, $109,631.81.

Washington County, Cecil and North Strabane Townships, 19,308 ft. reinforced concrete: Low bidder, Samuel Gamble Co., Carnegie, $91,811.40.

The foregoing are state highway routes, although in the case of Allegheny and Cambria Counties the county authorities have contributed toward the construction of the roads. The following bids are on state aid applications:

Delaware County, Nether Providence Township, 4,250 ft. brick on concrete base: Low bidder, James E. Kelley, Darby, $25,101.50. This is a readvertised contract, former bids having been too high.

Forest County, Hickory Township, 5,385 ft. water bound macadam on telford base: Low bidder, South Shore Construction Co., Erie, $11,527.64.

COMING MEETINGS

August 17-19—Texas Good Roads Association—Annual meeting, Modina Lake, San Antonio, Tex. Secretary, D. E. Colp, San Antonio, Tex.

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

The Park-to-Park Highway Association, which is interested in a movement to construct a highway connecting the highways in the Rocky Mountains, will meet at Yellowstone National Park, July 24. The Chairman of the Committee of Arrangements is Gus Holmes, Cody, Wyo.

The annual Good Roads Congress, held under the auspices of the Texas Good Roads Association, will take place this year at Modina Lake, San Antonio, Tex., on August 17, 18 and 19. The program is in course of preparation. D. E. Colp, San Antonio, Tex., is Secretary of the association.

The meeting of the Forrest Highway Association which was to have been held at Gadsden, Ala., July 18, has been postponed until August 8, owing to the condition of the roads. Many bridges have been washed out and parts of the highways in the neighborhood of Gadsden have been under water.

MEETINGS

The League of Michigan Municipalities, at its recent meeting at Battle Creek, Mich., elected the following officers: President, Joseph W. Marsh, Mayor of Battle Creek; Vice President, E. F. Johnson, Mayor of Flint; Secretary-Treasurer, Charles A. Sink, Alderman, Ann Arbor. The next annual meeting will be held at Grand Rapids.

The Knox County Good Roads Association was formed recently at a meeting held at Galesburg, Ill. The officers are A. F. Paden, Galesburg, President; David Cation, Williamsfield, Vice President; M. B. Woolsey, Galesburg, Secretary; H. Huggins, Galesburg, Treasurer. The object of the organization is to eventually secure a complete system of county highways.

PERSONAL NOTES

F. A. Gould has been appointed City Engineer of Owosso, Mich.

A. W. Mosley has been appointed Chief Deputy Highway Engineer of Missouri.

Elliott N. Smith has been appointed Supervisor of the recently created Bureau of Engineering at Nutley, N. J.

Charles E. Fanning, paving contractor, has been appointed Postmaster of Omaha, Neb., by President Wilson.

J. Vinton Dart, Engineer in Charge of Highways for the Public Works Department of Providence, R. I., has resigned.

B. E. Briggs has resigned as City Engineer of Erie, Pa., to enter private practice. He held the city office for 23 years.

F. G. Lynch has been appointed City Engineer of Erie, Pa., succeeding B. E. Briggs, whose resignation is noted elsewhere in this column.

A. E. Broker, Assistant County Engineer of Milwaukee County, Wis., has resigned to take a position as Superintendent of the Chickamauga Quarry & Construction Co., Savannah, Ga.

R. A. Vickere, Department of Public Works, Providence, R. I., has been promoted to be Engineer in Charge of Highways, vice J. Vinton Dart whose resignation is noted elsewhere in this column.

NEWS OF THE TRADE

The Troy Wagon Works, Troy, Ohio, has issued a folder, printed in two colors, descriptive of the Troy trailer as adapted to use by the army on the Mexican border. The publication is illustrated with halftones.

The government has purchased 231 motor trucks from the Kelly-Springfield Motor Truck Co., Springfield, Ohio, for the use of the army. Of these 165 are three and one-half-ton trucks and the balance one and one-half tons capacity. The order is for seven motor truck companies, each comprising 33 trucks. The Kelly-Springfield company is not only furnishing the trucks complete, but has agreed to recruit and train the men for the companies. Each company consists of a truck master and three assistants, a chief mechanic and two assistants, 44 drivers and two cooks. One company has already gone forward completely equipped.

NEWS NOTES

The Wasco County, Ore., Good Roads Association is conducting an active campaign for a bond election to be held in November on the question of issuing road bonds to the amount of $260,000.

The Board of Public Works of Los Angeles, Cal., has prepared a summary of statistics showing that during the last fiscal year the city paved and otherwise improved 59.36 miles of streets and that orders are pending for paving about 34 miles in addition.

Authorities of Mercer County, N. J., are considering the advisability of abandoning navigation on the feeder of the Delaware and Raritan Canal, between Trenton and Lambertville and utilizing the tow path for the purpose of widening the River Road which it is proposed to convert into a boulevard.

San Diego, Cal., Commercial Organizations have a general good roads committee composed of three members of each organization. The committee recently recommended to the Board of Supervisors of San Diego County, the appointment of a committee to devise plans for the repair of roads and construction of bridges throughout the county.

GOOD ROADS

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NEW YORK, JULY 29, 1916

Number
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Vermilion County, Illinois, Dedicates First Section of Concrete Roads

The first section of the concrete roads being built in Vermilion County, Ill., under a $1,500,000 bond issue, was completed recently in Newell Township and was formally dedicated in the presence of Governor Dunne of Illinois, officials of the Illinois State Highway Department and about 5,000 residents of the county.

The ceremonies incident to the acceptance of the road by Governor Dunne on behalf of the state, included the clipping of a ribbon, which had been stretched across the road, by Miss Marie Phillips of Bismarck, Ill., and a parade in which nearly 500 automobiles took part. O. M Jones of Danville, Ill., Chairman of the Vermilion County Road Committee, gave a brief history of the good roads movement in the county and James P. Wilson of the State Highway Commission, spoke on "The Farmer and the Road Question."

As has been noted in "Good Roads" from time to time, Vermilion County is building 141 miles of concrete and 28 miles of brick roads under state aid and the bond issue referred to above. Contracts were let in March. The work is being done under the supervision of P. C. McArdle, Assistant Chief State Highway Engineer, and, according to present indications, will be completed in about two years.

Federal Prisoners at Leavenworth, Kansas, May Do Road Work

Warden T. W. Morgan of the Federal Prison at Leavenworth, Kan., is endeavoring to obtain from the Department of Justice, permission to employ a number of convicts on road work.

There are approximately 2,000 prisoners confined at Leavenworth and there is employment for only about 1,500 of them, including several hundred who are at work on extensive additions to the prison.

The warden's plan is to employ the surplus convicts on the construction of either macadam or brick roads on the government reservation, which are generally used by the public. The prison brick plant has a capacity of approximately 40,000 brick daily. In order to carry out the plan ten extra guards would be needed.

Roads and Bridges Damaged by Floods in Several Southern States

Considerable damage has been done recently by floods in several states in the South, where roads and bridges and, in some instances, city streets, have been washed out.

The states in which the most serious damage resulted are Florida, Alabama and Mississippi and portions of Louisiana, Georgia, the Carolinas and Eastern Tennessee. The damage to bridges was confined almost entirely to wooden structures, steel and concrete bridges for the most part, escaping harm.

An example of this is found in the bridge over the Cahaba River on the Birmingham-Montgomery Road, near Birmingham, Ala. This structure connects Jefferson and Shelby Counties. The Jefferson County end is of steel and escaped damage, but the Shelby County end is of wood and about 20 ft. of it was washed away.

County commissioners of Thomas County, Ga., where a number of bridges were damaged, have announced their intention of replacing all wooden bridges with steel or concrete structures.

It is reported that a considerable mileage of macadam roads in the flooded districts were so badly damaged that entire reconstruction will be necessary.

Nearly 350 Miles of Road Construction to be Let in New York State

During the month of August there will be four separate lettings of state highway work by the New York State Commission of Highways. The dates on which bids will be received are August 7, 14, 16 and 18.

The total amount of construction on which proposals are asked is 348.58 miles. The work is located in 40 counties and the mileage in each is shown in the accompanying table:

County	Length, Miles	County	Length, Miles
Albany	0.20	Oneida	11.89
Allegany	9.07	Ontario	7.03
Broome	16.98	Orleans	1.32
Cattaraugus	6.90	Oswego	7.29
Cayuga	5.45	Otsego	8.13
Chautauqua	0.74	Rensselaer	18.41
Cortland	6.07	Rockland	8.62
Delaware	14.81	St. Lawrence	13.72
Erie	36.39	Saratoga	4.85
Essex	4.95	Schenectady	8.28
Franklin	12.35	Schoharie	2.73
Fulton	9.44	Schuyler	3.01
Genesee	8.36	Seneca	13.56
Hamilton	10.96	Sullivan	10.97
Herkimer	5.67	Tioga	11.50
Jefferson	9.08	Tompkins	10.28
Monroe	3.69	Ulster	6.84
Montgomery	5.19	Washington	15.05
Nassau	3.38	Wayne	1.88
Niagara	8.06	Westchester	4.48
Total			348.58

Plan to Build Public Comfort Stations on All Main Highways

An organization known as the Public Comfort Station Bureau, New York, N. Y., is planning to have public comfort stations built at intervals on all main highways throughout the country. It is understood that the project has the approval of the American Automobile Association.

The intention of the bureau is to influence the establishment of one or more stations in each city through which a main highway passes. The stations are to be equipped with toilet facilities, drinking water, telephones and other conveniences. The waiting rooms are to be so arranged that they can be used as emergency hospitals in case of need.

In parts of the country where cities are far apart, it is planned to have counties or townships put up community buildings containing auditoriums, libraries and similar features in addition to the comfort station equipment.

Stations such as are contemplated would cost approximately $10,000 or less, depending upon the size of the city or town in which they are located. It is planned that the stations shall be self supporting and eventually pay for the cost of construction.

Bids Received for Nearly Ninety Miles of Road Work in Ohio

State Highway Commissioner Clinton Cowen of Ohio opened bids on July 20 and 21 for the construction of 89.78 miles of roads in 27 counties and one concrete bridge in Hamilton County, the low bid on which was $36,989.

This is the fifth important letting of road work by the Ohio State Highway Department this year. Disregarding figures on alternative types, the total amount of the low bids was $988,301.94. Details are given in the accompanying table:

County	Road	Length, Miles	Type	Bidder	Address	Amt. of Bid
Ashland	Ashland-Medina	1.43	Brick	E. F. Downs & Co.	Toledo	$23,037.70
Carroll	Minerva-Sandyville	1.33	Brick	Ward, Miller & McCoy	Wheeling, W. Va.	23,197.30
Champaign	Urbana-W. Jefferson	1.25	W. B. Macadam	J. C. McCann & Sons	Columbus	18,980.00
Clermont	Cincinnati-W. Union	1.05	W. B. Macadam	Ellsworth A. Meeker	Bethel	9,990.15
	Milford-Hillsboro	1.04	W. B. Macadam	John K. Spencer	Oregonia	8,667.30
Columbiana	Lisbon-Canton Sn.	6.02	Bit. Macadam	Seiple & Wolf	Youngstown	67,000.00
Cuyahoga	Rocky River-Berea	0.50	Brick (a)	Long & Bowen	Cleveland	12,188.00
Erie	Milan-Elyria	1.35	Bit. Macadam	Elyria Construction Co.	Elyria	15,206.00
	Savannah-Vermillion	1.02	R. F. Concrete	H. J. Neipfort	Elyria	16,361.50
Fayette	Springfield-Washington	2.00	W. B. Macadam	Seiple & Wolf	Youngstown	15,815.09
Gallia	Jackson-Gallipolis	1.04	W. B. Macadam	W. H. Martt	Gallipolis	9,500.00
	Gallipolis-Ironton	1.41	W. B. Macadam	W. H. Martt	Gallipolis	12,175.00
	Ohio River	0.78	W. B. Macadam	W. H. Martt	Gallipolis	6,089.75
Geauga	Painesville-Warren	0.91	R. F. Concrete	Farrell Eng. & Cons. Co.	Cleveland	10,850.00
	Chardon-Madison	1.70	R. F. Con. & Brick	Farrell Eng. & Cons. Co.	Cleveland	20,250.00
	Burton-Bloomfield	3.12	Concrete	T. M. Ward & W. A. Nims	East Orwell	32,000.00
	Cleveland-Kent	0.94	W. B. Macadam (b)	J. Buck	Chardon	8,731.98
Guernsey	Cambridge-Caldwell	1.25	(c)	John W. Butler	Cincinnati	9,689.00
Hamilton	Carthage-Hamilton	...	R. C. Bridge	Reno & C. F. Runck	Cincinnati	36,989.00
Hancock	Findlay-Kenton	3.00	W. B. Macadam	Latshaw & Stinchcomb	Fostoria	26,383.00
	Findlay-Bowling Green	4.15	Bit. Concrete	Johnson Cons. Co.	Chicago, Ill.	44,769.32
	Alternate	4.15	Asphalt or Tar	Graham & Kinnear	Columbus	41,551.80
	Alternate	4.15	Sur. Tr. Macadam	Graham & Kinnear	Columbus	34,922.07
Lake	Euclid-Chardon	1.51	R. F. Concrete	E. A. Freshwater & Sons	Chester, W. Va.	20,990.00
	Alternate	1.51	Brick	E. A. Freshwater & Sons	Chester, W. Va.	23,193.00
Lorain	Oberlin-Norwalk	3.15	Bit. Macadam	Elyria Construction Co.	Elyria	24,865.63
Lucas	Toledo-Napoleon	2.00	W. B. Macadam	C. W. Ryan	Maumee	18,950.00
Medina	Akron-Medina	2.51	Concrete	H. J. Neipfort	Elyria	28,117.54
Meigs	Middleport-Bradbury	1.02	Concrete	Mumaf & Ross	Pomeroy	20,557.08
	Alternate	1.02	Brick	George Bauer	Pomeroy	22,300.00
	Pomeroy-Athens	0.69	R. F. Concrete	George Bauer	Pomeroy	13,400.00
Mercer	Celina-Wabash	0.64	R. F. Concrete	Burnett & Christian	Rockford	9,234.90
Ottawa	Bono-Port Clinton	4.01	W. B. Macadam	J. Muldoon & H. Bergman	Genoa	27,220.00
Perry	Lancaster-N. Lexington	2.47	Brick	Swank & McIntyre	New Lexington	36,621.75
Pickaway	Lancaster-Circleville	1.00	Bit. Macadam	Hampshire & Wilson	Circleville	11,122.18
	Alternate	1.00	W. B. Macadam	Hampshire & Wilson	Circleville	9,100.00
Preble	Eaton-Richmond	1.00	Sur. Tr. Macadam	H. C. Foster & Sons	Richmond, Ind.	7,684.00
	Eaton-Greenville	1.13	Bit. Macadam	H. W. Curry & Co.	Eaton	9,950.00
Sandusky	Fremont-Bellevue	1.38	Brick	Modern Cons. Co.	Fremont	37,700.00
Stark	Canton-Canal Dover	1.49	Bit. Macadam (d)	W. D. Kelly Co.	Canton	10,608.28
Trumbull	Warren-Meadville	7.44	Bit. Macadam	Seiple & Wolf	Youngstown	57,312.08
	Warren-Meadville	6.84	Bit. Macadam	Smith Construction Co.	Youngstown	65,101.82
	Painesville-Warren	2.09	Brick	B. Oakley & C. L. Ensign	Courtland	34,049.00
Tuscarawas	Canton-Canal Dover	2.97	(c)	John W. Butler	Cincinnati	14,299.00
	W. Lafayette-N. Phila.	2.00	Brick	McElfresh, Danforth & Dover	Caldwell	36,805.00
Van Wert	Van W.-Spencerville	2.00	W. B. Macadam	A. J. Walther	Wapakoneta	14,438.00
	Van W.-Ft. Wayne	3.00	W. B. Macadam	Lloyd Putnam	Van Wert	23,890.00
	Van W.-Decatur	2.15	W. B. Macadam	Lloyd Putnam	Van Wert	15,769.67
Vinton	McArthur-Athens	2.00	Concrete	Kuhner, Kuhner & King	McArthur	17,800.00
Totals		89.78				$988,301.94

(a)—Repairs. (b)—Two-course. (c)—Bridges, culverts and grading. (d)—Resurfacing.

DETAILS OF ROAD CONTRACTS AWARDED BY OHIO STATE HIGHWAY DEPARTMENT

Road Work in Snohomish County, Washington, Now All Under Way

The entire amount of road work planned for this year under the $1,813,800 bond issue of Snohomish County, Wash., is now in progress. The total contract price for the 1916 work is $539,878.06.

Only a portion of the contracts provide for completed roads, the mileage being 45.8, but grading is in progress on 62.9 miles which will be paved next year.

The largest single contract awarded was for the construction of 9.5 miles of the Pacific Highway from Silver Lake to the King County line at $111,934.50.

Missouri Supreme Court Upholds Validity of Road Bond Election

The Supreme Court of Missouri has rendered a decision declaring regular and valid the bond election at which the voters of St. Louis County, Mo., approved the issuance of $3,000,000 in bonds for road construction.

The validity of the election and the legality of the bonds was attacked on a number of grounds, it being contended among other things that the property of municipal corporations in St. Louis County which would receive no direct benefit from the proposed road construction, was levied upon. Judge Farris, who wrote the opinion, stated that the urban and suburban portions of a county were interdependent and that permanent roads are for the general good of the county.

The court held invalid $520,000 worth of the bonds which the St. Louis County Court sought to issue, for the reason that the method of the proposed issue was in conflict with the state laws governing such matters.

Nashville, Tennessee, Expert Advises Centralization of Street Work

In a report to the City Commission of Nashville, Tenn., James Cameron, an efficiency expert who has recently completed a survey of the municipal government, recommends that the work of street cleaning, sprinkling and flushing be centralized under the direction of the city engineer.

At present the sprinkling is under the direction of the Fire Department, the commissioner of waterworks, work-house and street cleaning has charge of the street cleaning and the flushing comes under the control of the Department of Streets, Sewers and Sidewalks. A charter amendment would be necessary in order to carry out the recommendation.

Governor Hiram W. Johnson of California has been asked to designate a day during the week beginning August 6 to be observed throughout the state as Good Roads Day.

Residents on Commonwealth Avenue, Boston, Mass., have sent a check for $7,990.90 to Mayor Curley requesting that the amount be applied toward having the street resurfaced with bitulithic.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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St. Clair County, Illinois, Plans Construction of 186 Miles of Roads

Should a proposed bond issue of $1,500,000 be ratified by the voters of St. Clair County, Ill., at the regular November election, the county plans to build a total of 186 miles of county roads.

According to D. O. Thomas, County Superintendent of Highways, the proposed construction includes 65 miles of 15-ft. concrete roads, 47 miles of 10-ft. concrete roads, 6 miles of 15-ft. water bound macadam roads and 68 miles of earth roads, with permanent bridges throughout the county.

Porto Rico Needs More Than $2,000,000 for Roads and Bridges

According to estimates, the $2,000,000 bond issue for road construction authorized by the Porto Rico Legislature, and noted briefly in "Good Roads" for June 17, will not be sufficient to accomplish all of the work laid out.

It is figured that at least $4,000,000 will be required to construct the roads and bridges planned, under an act recently approved.

The order in which the work will be executed will be determined by the Economy Commission, a body composed of members of both houses of the Legislature.

Another Section of Mint Canyon Road to be Built in California

Plans and specifications for the construction of another section of the Mint Canyon Road have been completed and the Board of Supervisors of Los Angeles County, Cal., in which the road is located, will award the contract sometime in August. The contract for Section G, comprising 11.28 miles, was awarded this month at $86,375.44, as noted in "Good Roads" for July 22.

The new section, known as Section D, will be 10.63 miles in length and will be of 5-in. concrete, 20-ft. wide. The approximate quantities required, according to the estimates, are 94,275 cu. yds. excavation, 56,158 lin. ft. shaping roadbed, 124,793 sq. yds. concrete pavement, 336 cu. yds. Class A concrete for culverts and headwalls, 11,123 lbs. reinforcing steel and 22,000 lin. ft. guard rail.

Bids will be received on two distinct propositions. On one the county will furnish 23,231 bbls. Portland cement, 261 tons hydrated lime and 1,486 bbls. oil. The estimated cost of construction under this proposition is $125,493.75. The other proposition includes the items mentioned and, as well, 12,716 tons sand, 20,760 tons broken stone and 2,559 tons screenings from the county plant. On account of extra freight charges, the estimated cost of this second proposition is $132,885.25.

During July, August and September, Los Angeles County will award contracts for a total of 33.5 miles of road construction, 22.5 miles of which will be mountain road, at an estimated cost of $456,426. Included in this work are 134,424 sq. yds. of concrete pavement and 13,814 sq. yds. of macadam.

Georgia Legislative Committee Approves Highway Commission Bill

A bill creating a state highway commission has been approved by the Public Highways Committee of the Georgia House of Representatives. The bill, it is understood, is a substitute for the measure drafted by a committee of the Georgia Chamber of Commerce, a brief outline of which was published in "Good Roads" for June 17.

The present bill provides for the appointment of five commissioners who shall receive $10 a day for actual service, but not more than $400 a year each. The appointment of a chief engineer at a salary not to exceed $400 a month is also provided for.

New Jersey Chamber of Commerce Reports on Road Expenditures

Figures compiled by the State Chamber of Commerce of New Jersey show that during eight years from 1907 to 1915 inclusive, the year 1908, for which no figures were available, being omitted, there was expended for the repair of roads in the state a total of approximately $14,394,997. Of this amount $11,298,419 represented county funds and the balance of $3,096,577 came from the funds of the Motor Vehicle Department.

The specific amounts from each source expended in the various counties of the state are shown in the following table:

County	County Fund	Motor Vehicle Fund	Total
Atlantic	$380,440	$110.927	$491,367
Bergen	1,808,277	207,116	2,015,383
Burlington	244,132	253,761	497,893
Camden	291,769	185,755	477,524
Cape May	150,789	55.669	206,458
Cumberland	8,366	8,712	17,079
Essex	1,090,511	251,593	1,342.104
Gloucester	105,457	95,881	201.338
Hudson	2,334,700	147,021	2,481,722
Hunterdon	80,383	57,138	137,521
Mercer	654.719	218,036	872.756
Middlesex	896,949	255,681	1,152.630
Monmouth	793,210	252,847	1,046,058
Morris	877,252	262,122	1,139,375
Ocean	57,268	93,052	150.321
Passaic	802,035	192,998	995.034
Salem	51,109	62,614	113.724
Somerset	128.279	111,991	240,270
Sussex	32,294	33,451	65.745
Union	355,704	155,076	510,781
Warren	164,749	86,127	240,877
Totals	$11,298,419	$3,096,577	$14,394,997

In addition to these expenditures, the Chamber of Commerce report states that there were expenditures for repairs and construction by the state, counties and local divisions which would bring the total amount spent during the period in question up to nearly $35,000,000.

Last Thursday Observed as Good Roads Day in Tennessee

In accordance with the proclamation of Governor Thomas C. Rye of Tennessee, Thursday of this week was observed as Good Roads Day throughout the state.

Governor Rye, in his proclamation designating the day, called attention to the fact that in 15 years the state had expended approximately $30,000,000 for highway improvement.

New York City Engineers Asked to Join Guard Regiment

Engineers of New York, N. Y., who have interested themselves in the national preparedness movement, are being solicited to join the depot battalion of the 22d Regiment of Engineers, of the National Guard of New York, which is intended to replace the regiment which is at present doing field duty.

It is the intention to enlist six companies to serve for three years or until the return of the regiment, when members of the battalion may be mustered out with the option of joining the regiment.

The new organization will be outfitted as engineer troops at the expense of the state and will be drilled in tactics and military engineering by Major J. F. Fairchild at the 22d Regiment Armory.

COMING MEETINGS

August 17-19—Texas Good Roads Association—Annual meeting, Modina Lake, San Antonio, Tex. Secretary, D. E. Colp, San Antonio, Tex.

August 21-22-23—Union of Canadian Municipalities—Sixteenth annual convention, Montreal, P. Q. Secretary-Treasurer, W. D. Lighthall, K. C., Montreal, P. Q.

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Hamilton County, Ohio, Dixie Highway Council

The Hamilton County, O., Dixie Highway Council will hold a good roads exposition and convention at Music Hall, Cincinnati, O., September 1 to 9 inclusive. Included in the exposition will be exhibits of the products of the leading cities on the route of the Dixie Highway.

The convention program will include addresses by the governors of the states through which the highway passes, lectures by heads of various highway associations and a good roads school for county officials.

MEETINGS

State Association of Planning Commissioners

The State Association of Planning Commissioners of Pennsylvania was formed at a meeting held July 11 at Harrisburg, Pa. The membership consists of city planning commissioners and the object of the organization is to discuss the various problems with which the members have to contend.

The officers are as follows: President, A. B. Farquhar, York; Vice President, E. S. Herman, Harrisburg; Secretary, J. Herman Knisely, Harrisburg; Treasurer, John K. Stauffer, Reading.

Montana Automobile and Good Roads Association

At the seventh annual meeting of the Montana Automobile and Good Roads Association, held at Anaconda, Mont., July 13, 14 and 15, it was decided to hold the next meeting at Helena. The following officers were all re-elected:

President, E. P. Mathewson, Anaconda; First Vice President, Nelson Story, Jr., Bozeman; Second Vice President, Louis Newman, Great Falls; Secretary-Treasurer, Martin Martin, Anaconda.

Among the papers read at the meeting were the following: "Needed Legislation for Automobiles and Good Roads," Oscar Rohn, President Automobile Club of Butte; "The State Highway Commission," George W. Metlen, Secretary of the commission; "The National Parks Highway," L. H. Brown, Spokane, Wash., Secretary, Washington State Good Roads Association. Other speakers were F. E. Bonner and F. A. Silcox of the Forest Service.

PERSONAL NOTES

Charles Anderson, a highway contractor, died recently at his home in Ellensburg, Wash.

J. M. Owens, Road Superintendent of Jefferson County, Pa., has tendered his resignation to take effect August 1.

Don Juan Whittemore, who was the oldest Past President of the American Society of Civil Engineers, died recently at his home in Milwaukee, Wis.

Willis Whited, M. Am. Soc. C. E., Bridge Engineer of the Pennsylvania State Highway Department, has received the honorary degree of Doctor of Engineering from Iowa State College.

H. M. Dorwart, who has been with the Pennsylvania State Highway Department for five years, has been appointed Acting Road Superintendent of Jefferson County, Pa., to fill the vacancy caused by the resignation of J. M. Owens, noted elsewhere in this column.

R. B. Murdock has been appointed Assistant Engineer of the Oregon State Highway Department and placed in charge of the surveys for highway work in Coos County, Ore., where he was formerly County Roadmaster. The work will be done under a recently voted bond issue of $362,000.

NEWS OF THE TRADE

Thomas G. Bush, who was Assistant State Highway Commissioner of Washington, has organized the contracting firm of Thomas G. Bush & Co., Spokane, Wash.

The Packard Motor Car Co., Detroit, Mich., has received an order from the War Department for 198 additional motor trucks for service with the army on the Mexican Border.

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Unusual Practice in the Construction of Granite Block Pavements in Three Cities

In a recent repaving job in the Borough of Brooklyn, New York City; in work done during the past two years in Baltimore, Md., and in the paving of a street in Columbus, Ohio, several unusual methods of construction and design have been employed. Successful results have been obtained in the construction work in Brooklyn and Baltimore and in the design followed in Columbus there are features which recommend it for streets carrying varied traffic.

Brooklyn, New York

The Brooklyn work, which at this writing is in progress, consists of repaving about 35,000 sq. yds. of street, through which run an elevated railway and a double track street car line. The old wood block pavement was laid on a 5-in. concrete base and had been opened to an unusual extent. The new pavement which replaces it consists of a 6-in. concrete foundation on which is laid a granite block pavement on a 1-in. sand cushion. The blocks used are of the "improved" type from 3½ to 4½ ins. wide, from 8 to 12 ins. long and from 4¾ to 5¼ ins. deep. On account of the greater thickness of the new pavement it was necessary to excavate several inches of the old subgrade to keep the new pavement at the same grade as the old, as well as to remove the old wood blocks and foundation. It was in this excavating and in the filling of the joints that unusual methods were employed.

While some of the old pavement was torn out by laborers with picks, much of it was taken up with a Keystone traction excavator. This machine, which is made by the Keystone Driller Co., of Beaver Falls, Pa., is similar to the ordinary steam shovel in its main features of construction and operation except that the scoop, called a "skimmer" scoop in this instance, travels along a boom which can be swung from side to side and raised and lowered. When in use for tearing up the old pavement or removing the shallow subgrade the boom is practically horizontal. On the Brooklyn work the machine picked up the old wood blocks and loaded a 2-yd. wagon in about 5 minutes. It was used to advantage also in taking up the old concrete base.

The filler used consisted of coal tar pitch and sand, mixed in a special machine devised by the sub-contractor who laid

FILLING JOINTS IN AN IMPROVED GRANITE BLOCK PAVEMENT WITH FILLER MIXED IN MACHINE SHOWN AT LEFT—BROADWAY, BROOKLYN, N. Y.

EXCAVATOR USED IN BROOKLYN WORK FOR TEARING UP OLD PAVEMENT.

the granite blocks. This machine consists of a small tank through which runs a shaft carrying paddles. The shaft is connected with a crank on the outside of the tank. The sand and pitch are heated to approximately the same temperature, and fed into the mixer, in the proportion of about 30 per cent. of sand and 70 per cent. of tar. After being mixed by the revolving paddles the filler is discharged into special pouring buckets. The bucket has a wide spout leading back to an opening 4 ins. wide and 4 ins. high in the side of the bucket at the bottom so that the filler is drawn from the bottom of the bucket. Just before being poured the filler is stirred with a stick.

The first application of the filler is made by dumping the contents of the buckets on the surface of the pavement and then scraping it into the joints. Two or more applications are needed to completely fill the joints because of the settlement of the filler. All applications after the first are made by pouring the filler from the spouts into the joints.

The contractor is the Charles A. Myers Contracting Co., and the sub-contractor for the paving is Fred Hesse.

The accompanying illustrations show the excavator used for removing the old pavement and excavating the subgrade, the machine for mixing the filler, and the work in progress.

PLACING CONCRETE FOUNDATION FOR GRANITE BLOCK PAVEMENT IN BROOKLYN.

Baltimore, Maryland

In two of the accompanying illustrations are shown examples of a type of bituminous filled granite block pavement that has been used with marked success in Baltimore, Md. Each of the illustrations is of a street intersection where the pavement has been down at least two years. As may be seen, there is an excess of filller which forms a thin carpet over a large part of the surface of the pavement. The work has been under the direction of R. Keith Compton, Chairman and Consulting Engineer of the Baltimore Paving Commission, and Bruce Aldrich, Chief Asphalt Inspector of the Commission. Mr. Aldrich, the originator of the filler, describes the material and its application as follows:

> In granite block paving the question of a satisfactory filler has caused, in the past, much worry to the engineers in charge of this type of construction. Cement filler is without doubt the most satisfactory, but as a cement grouted street has to be closed for not less than two weeks to allow the cement to harden properly, the engineers have had to use various other materials as fillers, in order to throw the streets open to traffic as soon as completed.

POURING SAND AND PITCH FILLER ON BROADWAY PAVING, BROOKLYN, N. Y.

> In Baltimore, a number of different tars and asphaltic fillers have been used, with varying success. Some were too brittle. Others had no ductility and would not adhere to the blocks, thus allowing water to seep through the joints, displacing the sand cushion or freezing in winter time, thereby heaving the pavement out of shape. After trying a number of fillers, the Paving Commission of Baltimore finally found one which, up to the present time, has given excellent results. This filler is refined from Mexican crude oil and has the following characteristics:

Bitumen soluble in CS_2	99.80%
" " " CCl_4	99.80%
Specific Gravity, 60° F	1.042
Penetration at 32° F	17
" " 77° F	45
" " 115° F	160
Ductility at 77° F	60 cm
Loss 325° F, 5 hrs. 20 grm	none
Pen. at 77° F, after this	32
Per cent. hardened	28.8
Melting point, Cube Method	155° F

> To obtain best results when using this filler, the granite blocks are laid with close joints (not over ½ in.) on a bed consisting of 1 part Portland cement and 4 parts of clean, screened, sharp sand, with a depth of 1 in. The surface of the pavement is covered with hot torpedo gravel which is swept into the joints to a depth of about 1 in. The blocks are then rammed, after which the joints are poured half full with asphalt block filler. They are then filled to within ½ in. of the top of the blocks with torpedo gravel and again poured with filler, which

flows over the blocks covering the entire surface of the pavement. Hot gravel is then thrown over the surface, which can, in a few hours, be opened to traffic; in fact, the sooner the better, as the action of the horses' feet and wagon wheels tends to caulk the material into the joints.

In using this filler care should be taken to have it at a temperature between 375° and 425° F, as it will not penetrate and fill all interstices if poured at a lower temperature.

It is also imperative that the blocks should be perfectly dry and free from dust, as the filler will not adhere to a wet or dusty surface.

Mr. Compton recently wrote us in reference to this work that on the intersections, which have now been down for two years, the mat is still on top of the blocks. It has spalled off in places, though not to any great extent. Its appearance is very similar to that of sheet asphalt, according to Mr. Compton, and where the mat has spalled off the filler is left firm and flush in the joints, giving the pavement a very even surface and fully protecting the edges.

Columbus, Ohio

An interesting feature of pavement design is shown in the accompanying illustration of a portion of High street in Columbus, Ohio. This is one of the principal streets of the city, nearly all the retail stores being situated on that portion between the Court House and the Union Depot, a distance of about one mile. The pavement shown was completed in June, 1915. The following information on the design adopted and the reasons for it was recently furnished us by Chief Engineer Henry Maetzel, of the Division of Engineering and Construction, Department of Public Service:

HIGH STREET, COLUMBUS, OHIO—GRANITE BLOCK AND SHEET ASPHALT PAVEMENTS.

The width of the roadway is 60 ft. The center of the roadway is occupied by a double track street car line which occupies about 17 ft. The space between the tracks and 1 ft. outside of the rails was paved by the street car company with grout filled granite block.

The pavement laid by the city consists of a grout-filled granite block gutter 6 ft. wide and a 15½-ft. strip of sheet asphalt on each side of the tracks. The foundation is a 1:3:6 mixture of concrete, 6 ins. thick.

The Trinidad asphalt roadway is composed of a close binder 1½ ins. thick and a wearing surface 2 ins. thick. The wearing surface is composed of lake sand, Portland cement filler and Trinidad asphalt fluxed with Mexican oil. The pavement was laid at a penetration of 50.

Most of our downtown streets are too narrow to park automobiles at an angle to the curb, and they are therefore drawn up parallel to the curb.

A 6-ft. granite block gutter was adopted because it was thought that most of the machines parking along the street would stand on this space and would not rut the asphalt, which was laid rather soft to prevent cracking. The gutter also catches all of the grease from the machines and of course all other street wastes are carried by the gutters to the catch-basins.

BITUMINOUS FILLER ON GRANITE BLOCK PAVEMENT AT HOWARD AND CENTER STREETS, BALTIMORE, MD.

The width of the granite block gutter was increased to 10 ft. on the approach to the viaduct, which has a 4 per cent. grade. This was done to form a driveway for heavily loaded wagons going over the viaduct.

When the asphalt begins to need repair the 6- and 10-ft. gutters are wide enough to permit the passage of traffic while repairs are being made.

The contract price, including foundation, was $2.10 for the asphalt and $3.73 for the granite block gutter. The granite blocks average 5 ins. in depth.

McDonough and Jackson Counties, Georgia, have lost the designation of the eastern division of the Dixie Highway between Atlanta and Macon, and several other counties have been placed on probation, because of failure to build their sections of the road. This action was taken at a meeting of the executive committee of the Dixie Highway Association held at Chattanooga, Tenn., early in July, and is part of a plan intended to expedite the improvement of the road. It is announced that the association is preparing to issue its first official detailed map and guide book and that there will be included no section of the highway which has not been built or for which adequate provisions for construction have not been made.

BITUMINOUS FILLER ON GRANITE BLOCK PAVEMENT, HOWARD AND FRANKLIN STS., BALTIMORE, MD.

Tax Burdens Increased By Great Bonded Debt[*]

By JOHN S. CHAMBERS[†]

I am particularly glad of this opportunity to appear before you. I have in mind certain facts as to the cost of maintaining our state, city and county governments, with special reference to our huge and ever-growing bond issues, that I want to lay before you. I know of no body of men more fitted to hear and consider these matters or which can do more to force the putting on of the brakes. You know general conditions as well as, or better than, I do, but I may be able to give you some details that will arouse your interest. If I can get you and men like you into action, I will feel I have accomplished a great deal.

The Hon. Job Hedges, of New York, once remarked that "government is an institution to live under and not on." The witticism would make a fine text for a sermon. It contains a great truth, though uttered in jest—a truth which if it were appreciated and observed would do much to simplify government financial problems and relieve taxpayers of unnecessary burdens.

The people, in the final analysis, are to blame. They know, generally speaking, little of matters pertaining to government, particularly to the financial side, and, what is worse, as a rule they don't care to know. They vote for this man or that either because he belongs to their party, or because they know him, his family or some of his friends. What he may or may not know about the duties of the office to which he aspires or about political issues or governmental problems generally doesn't worry them.

One of the most important things to be done, or at least which should be done or attempted, is the education of the public as to public business—their business. Until they do understand, until they take an intelligent interest in government, we cannot hope for great improvement, and you gentlemen are particularly fitted to become teachers in this great public school.

Before taking up the bond question, which has a direct and material bearing on taxation, I would like to give you a bird's-eye view of the financial situation in recent years as it affects the state and its subdivisions.

Our present tax system—that is, the separation of sources as between the state on one hand and the cities and counties on the other—went into effect in the fiscal year of 1911-12. The state tax for the year before—under the old ad valorem general property system, as is still maintained by the cities and counties—was $10,164,814, as against $10,373,762 for the first year of the new system, and $13,516,046 for the present year—a growth of $3,142,284 in five years, or 30.3 per cent.

The assessment roll of the counties of the state in 1910-11—the last year of the old system so far as the state is concerned—was $2,599,916,690, as against $3,232,646,152 for 1915-16, an increase of $632,729,462 in six years, or 24.4 per cent. If the average of the assessments by the counties is 50 per cent. of the true value, then the real estate, improvements and personal property assessed to the taxpayers of California total about six and a half billion dollars.

And this plus property that escapes taxation.

I'm reminded of the small boy who asked his father what was meant by the expression "untold wealth" which he saw so often in the papers. "Untold wealth, my son," replied the wise father, "is wealth about which we forget to tell the assessors." So we may call California a seven-billion-dollar state, exclusive of its franchise and other intangible values, and to say nothing of the non-taxable property owned by the state amounting to over $100,000,000 and like property belonging to the federal government and our cities and counties.

On the assessed value, this year, of $3,232,646,152, a state rate of about 42 cts. on the hundred dollars would be required to produce an amount equal to that derived from the tax on corporations. In 1910-11, the last year of general property taxation by the state, the rate was 35.3, but the average for the ten years preceding 1911-12 was 44 cts. So it will be seen that an ad valorem rate for this year, if we were under the old system, would be slightly under the average of the decade cited. In other words, while our assessment rolls have increased 24 per cent., the rate, if the state were under the old system, would show practically no change.

The total receipts of the state and its cities and counties for 1915, from all sources, was $167,012,148 and the expenditures for all purposes $176,422,681.

As the Controller's office did not begin to keep a record of the financial transactions of the state's subdivisions until five years ago, I will give only the percentages of increase as to receipts and expenditures for the state and the cities and counties for that period. One or two of my predecessors tried to gather data of this kind, but, having no law as we now have to back them, failed.

The state's receipts from all sources in 1915 were $29,830,182, an increase of 66.7 per cent. in five years. The average of all the states for the 10-year period running from 1903 to 1913 was 94.3 and for the federal government, 45 per cent.

The state's 1915 expenditures for all purposes totaled $36,529,593, an increase of 103 per cent. for the five years in question, as against an average of 105.9 for all the states for ten years, and 54.5 for the Washington government.

Apparently, then, the state's percentages of increase for receipts and expenditures, on the five-year showing, is under that of the average of all the states.

The city receipts for 1915, including San Francisco, were $68,724,578, an increase of 46.9 per cent. in five years, as against a 99 per cent. increase for all the cities in the country, from 1903 to 1913.

Expenditures by California cities, including San Francisco, for 1915 totaled $69,922,592, an increase in five years of 59.5 per cent., compared with 101 per cent., average, for all this nation's cities for the decade in question.

The counties of the state, exclusive of San Francisco, collected in 1915 the sum of $68,457,388, an increase of 66.5 per cent. in five years, as against 85.8 per cent., average ten-year advance, for all the counties of the country.

And the counties, in 1915, expended $69,970,496, or 78.2 per cent. more than five years before, as against 95.2 per cent., average, for all the counties of the various states of the Union in the ten years from 1903 to 1913.

You appreciate the fact, of course, that we have to take the federal statistics as they come to us. They are not as near to date as are our state figures and also, in the past five years, our figures as to the financial transactions of our cities and counties.

But they are close enough to make comparisons worth while and to give us a fairly good idea as to whether or not we are collecting and spending, on a percentage basis, more or less than our sister states and their cities and counties. The comparisons are not conclusive, since conditions vary so in the different states and their subdivisions, but they serve to point the way.

In the past five years, taking the average of the percentages I have quoted to you, the receipts of our state and its cities and counties have increased 60 per cent. and the expenditures 80 per cent. Yet we appear to be under, and, it would seem, certainly do not exceed, the receipt and expenditure increases in other states and their cities and counties.

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[*] Paper presented at the 1916 convention of the County Supervisors of California.

[†] State Controller of California.

But whether we do or not, the totals of our receipts and expenditures are huge and the percentages of increase alarming. The time has come for very serious thought. There is no question that as our population grows and our governmental problems multiply, the legitimate cost of government will go up. That cannot be avoided. But we should put the brakes on. Even legitimate expenditures can be held down or postponed to more propitious occasions.

In the past fifteen years or so there has been a great expansion in the functions and cost of state and national governments. Expenditures have increased far more rapidly than population and in all probability faster than wealth or income. This condition is common to all our states and to the nation at large. It does not apply to California alone, as I have shown, or to her cities and counties more than to like subdivisions in other states. The situation is a serious one, and particularly so because it is so widespread. The whole country is involved.

One of the great contributing causes to this condition is the bond issues of our states and their cities and counties, bond issues, bear in mind, authorized and only made possible by the vote of the people. Officials spend the proceeds of bond sales, but the initial responsibility is not theirs. Let us not, if you please, lose sight of this fact. Our bonded debts add tremendously to our tax burdens.

In 1913, according to the Census Bureau, the United States Government had outstanding a bonded debt of $967,366,100.

In 1915, California and its subdivisions staggered under a bonded debt of $252,837,504, with the state holding, in addition, bonds authorized but unsold amounting to $15,202,000, while the cities and counties also had large issues in reserve awaiting sale.

Segregated, the state's outstanding bonded debt (as of 1915) is $31,311,500, an increase of 451 per cent. in five years. This is made up, as far as sold, of $18,000,000 for the state highway project, $5,800,000 for new buildings and $10,000,000 for San Francisco harbor improvement.

The bonded debt of the counties, including districts, is $92,466,091, an increase in five years of 308 per cent., while that of the cities, including the city and county of San Francisco, is $129,059,913, an increase of 96.8 per cent.

The average percentage of increase for those three divisions for the period in question is 285 per cent.!

The state's interest bill last year was $1,636,215.

At 4 per cent. (which is lower than the average of the prevailing rates) the interest on the entire bonded indebtedness, in 1915, figures $10,113,500.

And this does not include the state's share on the bonds of the cities, counties and districts outstanding on November 8, 1910, amounting to $77,682,312, when our new system went into effect. It was held, and justly I think, that the state should pay its proportion of this debt and the interest. But it would have been better to have fixed a definite amount, as was done in the case of the counties which are being reimbursed by the state for the loss of railroad property for assessment purposes.

I say this because as the principal outstanding in November, 1910, is reduced, the state's share for some reason is increased. In 1911-12, we refunded to the cities, counties and districts $650,324; in 1913-14, $742,637, and this year it will amount to $700,000 or more. The refunds grow like Civil War pensions.

Some people think that inasmuch as the people pay no taxes on the assessment of the property of public utility companies, while the state does, that local assessors get a bit careless, feeling that the more the state pays the less the cities and counties will have to put up. Of course, new buildings, plants, equipment, roadbeds, pole lines, etc., have come in since 1911, but I question whether they should be assessed and the state taxed thereon for bonded debts created before they came into being. The question is an involved one. The whole situation, I may add, is unsatisfactory.

In olden times sons were held responsible for the debts left by their fathers. If such were the law now, we would consider it outrageous. Yet, collectively, we are doing this very thing, through our ever-growing bond issues. We vote away millions of dollars with scarcely a thought as to the future. The bonds will run anywhere from 15 to 40 years or longer, with the bulk of the interest and principal to be paid by our children and our children's children who are yet unborn. This amounts to taxation without representation with a vengeance!

An Indiana congressman who was criticised for voting to saddle a debt upon future generations exclaimed: "What of it? What has posterity ever done for us?"

But how about our duty to posterity?

"Civilization will stop," said H. A. Mason in an address at San Francisco last summer, before the National Association of Controllers and Accounting Officers, "when a given generation of people cannot provide for the advancement of its successor."

We have no right to so burden those who are to follow us that they must struggle to pay off debts incurred by us was no time to progress and improve, as each generation should progress and improve upon the preceding generation, and do its part to make the path of the coming generation easier and happier. This is one duty we owe to posterity.

Even if we are indifferent to ourselves, to the tax burdens we heap upon ourselves—which may be our own concern and no one else's—yet we have no right to pass such burdens on to those who are to come after us and who, now, can have no voice in such matters.

But I protest not only in the name of posterity but in the name of the taxpayers of the present day. The burden is already heavy enough—too heavy. The time has come to stop and think.

And I know of no set of men better able to apply the brakes than you gentlemen. Your word in matters of this kind would go a long way. A warning from you would not go unheeded. It would be considered the voice of financial authority. I do not think I am unduly alarmed. I think we are facing a very grave situation, indeed.

I am not advocating the complete cessation of bond issues. Such a course would not be practicable. But we could hold future issues to matters of the first importance and which could not well be taken care of by direct taxation. A little patience would accomplish much. Rome was not built in a day. And so with us; we need not strive to do everything in our day and generation. Let us try direct taxation as far as practicable; bond issues after that for such things as should not be neglected, and leave the rest to God and those who are to follow us.

Our outstanding bonds are long-term issues. Financiers formerly favored bonds of this character, but sentiment in this regard is changing, I am advised. But whether it is or not, I think the state, the cities and the counties hereafter should issue only short-term bonds, serial in character rather than optional or payable upon a fixed date. Certainly bonds should not be issued for a period in excess of the probable life of the contemplated improvement, if that long. This would throw the tax burden where it belonged. And if the issues are held to projects of the first importance—issues which would prove too great a burden by direct taxation—a great step toward lightening the load on the inverted pyramid will have been taken.

Another step that also would lighten this load is the refunding of our present long-term bonds into short-term issues at lower rates of interest. You gentlemen are in a better position than I am to pass upon the practicability of this suggestion. It seems feasible to me. I am advised that the Federal Reserve Bank Act has caused a demand for short-term bonds for purposes of rediscount. By taking advantage of this demand and favorable bond market conditions, why would it not be practicable to refund our long-term securities into short-term obligations at lower interest?

If this could be done and if we would put on the brakes as to the future, a situation that now is pregnant with danger would be relieved and in time a basis reached that would be safe and sane.

The time has come to stop, look and listen.

Because a wrong policy has been pursued is no reason for continuing it. Rather it is the main reason why it should be discontinued.

Let us not be like the young man who when asked if he would vote to abolish capital punishment replied, "No, sir! Capital punishment was good enough for my fathers and it is good enough for me."

Bonds, and long-term bonds at that, may have been "good enough" for our fathers, but we are fast realizing they are not "good" for us and will be even worse for those who come after us. There is an especial significance, too, in the term "capital punishment" in this connection. Not that we may lose our lives if we persist in our present course—although we seem to have lost our heads—but we may lose much that makes our lives worth while.

Overhead Expenses in California Highway Work*

The question of "overhead" of the California Highway work is pertinent.

The commission operates a purchasing department and supplies to contractors all the material that goes into the road. It costs tens of thousands; it saves to the job hundreds of thousands by quantity purchasing and insures to the job honest materials. It runs up the "overhead," causing an expense that in other states is borne by the contractors. It is a unique feature of this character of work—but it justifies itself.

That the magnitude of the work may be appreciated note that the purchasing department in August last purchased and distributed approximately 3,145 cars of rock and sand, 385 cars of cement, 9,500 barrels of oil, and other materials aggregating about 4,750 cars, or nearly 200 cars per working day.

The commission does its own auditing and disbursing—and charges the "overhead" with the cost thereof. It is an unusual expense for this character of job—but it gets results in a way that saves money to the state.

The system of inspection with resident engineers on every job is expensive, but it is certain that honest work as well as honest materials go into the roads, and the slack ordinarily allowed for faulty construction is thus taken up.

At the beginning of work in any county, the "overhead" is 100 per cent.; an organization must be created, field work done, drafting and mapping completed, plans and specifications drawn, all before a single contract can be let. Gradually as actual construction progresses this preliminary cost is absorbed.

A recent statement shows a total expenditure from the highway fund of $13,746,396, distributed over 1,320 miles of state highway.

The cost of administration, technically known as "overhead," including the purchasing, auditing and disbursing departments, the commission's attorney and its secretary, the engineering assistants at headquarters, the division engineers and their assistants, and the clerical force, both at headquarters and in the divisions, including salaries, expense accounts, rentals, etc., amounts to $604,926, or 4.41 per cent.

Now, "overhead" may be variously limited and defined. To find a definition sufficiently broad to satisfy the most captious, suppose as "gross overhead" every dollar that did not find its way into the road itself in progress estimates or cost of materials be included.

Of the total expended, $11,591,188 represents contract payments and materials furnished—contracts let under the most spirited competition in bidding at a time when construction work was scarce and bidders correspondingly eager, and materials bought at the lowest prices known in California.

In other words, 84.32 per cent. of the total expenditure went directly into 1,320 miles of roads.

The 15.68 per cent. not so expended represents, in addition to the technical "overhead," every other character of expenditure—field and office drafting work, the most rigid and therefore expensive system of resident engineer inspection, salaries, expense accounts; everything.

The greater part of this expenditure has been apportioned and charged directly where it originated. The technical "overhead," however, cannot be so charged until the completion of the work makes possible a proportional distribution.

Included therein is equipment and stores on hand amounting to 1.19 per cent. Included also is the field and drafting work for 850 miles of highway in advance of contracts, amounting to 1.9 per cent.

Deducting these items, the "gross overhead" cost of building 1,320 miles of highway is 12.59 per cent. on an expenditure of a trifle over two-thirds of the $18,000,000. In other words, in spending two-thirds of the $18,000,000, the "gross overhead" has been reduced from 100 per cent. to 12.59 per cent.

Included therein are many other items not properly chargeable as "overhead," but not easily segregated. Thousands have been spent in designs and inspection of bridges being built by counties for the state highway, the cost of which does not appear in the capital expenditure. Field data have been gathered on many roads in addition to those permanently surveyed.

The Commission has faced a financial condition that made highway bonds unsalable in the open market. It has hampered the work and with a weaker organization would have ended it. But with county support, depreciated securities have been sold at par, thus financing the work.

Expert aid in office and in the field has been extended to counties that have needed help.

The good roads movement is new in California and the work of the pioneer has fallen to the Highway Commission.

Yet with it all the commission believes no similar work, whether private, corporate, or public, can show an administration at once so comprehensive and so economical as the state highway work in California.

The Desirability of Building for Beauty as Well as Utility was emphasized by Clifford Older, Bridge Engineer of the Illinois Highway Commission, in an article in a recent issue of the commission's publication, "Illinois Highways." The article consisted of the text of a paper presented by Mr. Older at a meeting of the Springfield Engineers' Club, the Springfield Association of Architects and the Springfield Art Club and was entitled "The Influence of the Engineer and the Architect in Promoting an Appreciation of the Beautiful." In it Mr. Older argued that the works of the great artists influence the nation's sense of the beautiful less than do the efforts of the engineer and the architect for while comparatively few people see great pictures, the public is confronted on every hand by the structures designed by engineers and architects. These are usually "unlovely" and Mr. Older expressed the belief that the constant sight of them dulls our sense of the beautiful.

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*From the "California Highway Bulletin" for July, 1916.

Recent Advancement in Brick Paving

By F. A. CHURCHILL*

During the past few years, municipal and highway engineers have been investigating the integral parts of brick pavements, and endeavoring to improve each part as to design, material and construction. New theories have been advanced and tested in the laboratory and in actual service. The leading universities of the country have been willing to cooperate with the use of their laboratories and the advice of the trained faculties of their municipal and highway schools.

The busy city engineer has been using his old design, his old specifications, and the construction has been inspected, if inspected at all, by untrained men, or political appointees. But this condition of affairs has now changed, and the paving engineer asks: "Why?" He will no longer follow any set of empirical rules or specifications; he thinks for himself, but is always willing to be shown.

Highway engineering has thus become a distinct branch of engineering, and its prominence is shown by the attention given it by the engineering and scientific societies of the country.

CONSTRUCTING THE CONCRETE FOUNDATION FOR A MONOLITHIC BRICK PAVEMENT.

Engineers have been giving considerable attention to the subject of pavements. Investigations are made as to the nature and bearing value of the soil; all springs or ground waters are taken care of; it is thoroughly rolled, and every effort is made to keep the subgrade free of water, unyielding, of uniform density, and of proper grade and cross section. This is a distinct advancement over the old haphazard way, and is of utmost importance, for many of our older pavements show the results of a water-soaked or badly prepared subgrade.

For the foundation course, the engineer must design for durability and economy. The type of foundation depends, therefore, largely upon local conditions—climate, traffic, subsoil and availability of stone, gravel or other suitable materials. The foundation should be designed to carry the load placed upon it and should be no deeper than is necessary to do this work. In the South many pavements are laid directly on a puddled sand subgrade and are giving good results, but in those sections where this type of construction is used there is no frost action and the traffic is light. Foundations of compacted gravel have proven satisfactory in Cleveland, O., and other northern sections, but for general use a foundation of concrete, so proportioned that 6 cu. ft. of concrete in place will contain one bag, or 94 lbs., of cement, is the foundation recommended by most engineers. Metal reinforcement is often used over an unstable subgrade or a lately filled trench. Engineers have also discovered that the smoothness of the finished pavement depends largely upon the smoothness of the foundation and its uniform distance below the finished contour of the pavement.

More real progress has been made in brick pavement construction methods during the past two years than was made in the decade immedately preceding. Established practice has been virtually revolutionized by the true monolithic and the semi-monolithic types of construction, the former providing for the laying of the brick upon a green concrete foundation, and the latter substituting a cement-sand bed for the old-time sand cushion. The development of these new types was directly influenced by observation of isolated instances of what may be termed accidental construction; but the improvements are indirectly due to the demands of modern highway and street traffic, and to a better engineering knowledge of the causes of defects in brick pavements which it was desirable to eliminate.

DOUBLE TEMPLATE USED TO PREPARE FOUNDATION FOR BRICK SURFACING IN MONOLITHIC WORK.

Engineers who had studied the subject thoroughly came to the conclusion some time ago that the sand cushion was an element of weakness in brick pavements, but it was not until 1915 that a satisfactory substitute was adopted. Prior to that year a few short stretches of pavement had been laid with a cement-sand bed, and one or two crude examples of monolithic construction existed. In each case the work was private or at most semi-public in character.

In 1915, the engineers of the Dunn Wire-Cut Lug Brick Co., of Conneaut, O., after experimenting with types and methods, perfected and reduced to a scietific specification basis the monolithic and cement-sand bed types of construction. The theoretical value of these types of pavement was quickly recognized by engineers as a practical means of over-

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*Dunn Wire-Cut Lug Brick Co.

FINISHING GROUTING WITH SQUEEGEES IN MONOLITHIC BRICK PAVEMENT CONSTRUCTION.

coming defects which hitherto had defied technical skill, but which had been traced to the sand cushion.

The persistency of the sand cushion for a score of years was not attributable to a belief that the sand cushion was the final word in brick pavement construction; it was due to the fact that nothing better had been devised for equalizing the surface inequalities of concrete foundations and providing a uniform bearing for the brick surfacing. In early years, concrete foundations were roughly finished, and it required 2 ins. of sand cushion to compensate the humps and hollows. As improved appliances came into use and as a better understanding of the principles of construction was acquired, smoother foundations were built and the depth of the sand cushion was reduced to 1½ ins. Now the sand cushion is eliminated entirely.

One of the greatest advancements in brick paving construction has been this elimination of the cushion of sand between the foundation and the brick wearing surface, and the substitution of a bedding or binding course of a mixture of cement and sand, not over 1 in. in thickness. This binding course should be considered as a part of the foundation. For example, if a 5-in. concrete foundation is needed it should be designed 4 in. of concrete and 1 in. of cement sand.

FINISHED MONOLITHIC BRICK PAVEMENT BEFORE REMOVAL OF SIDE FORMS.

The advantages of the cement-sand bed, and the disadvantages of the cushion of ordinary sand, have been pretty fully discussed in technical papers and before engineering and scientific societies. It has also been proven that many failures in brick pavements can be traced to the cushion of sand; that "resiliency" is a term which should not be applied to a brick wearing surface; that the sand cushion does shift, yield and is compressed by traffic weight, leaving small air spaces under the brick wearing surface; that air spaces under the brick surface are also caused by variations in the dampness of the sand cushion, the sand shrinking when drying. These small air spaces cause the pavement to rumble under traffic, and also become weak spots where eventually there may be a settlement in the event of the breaking of the bond between the bricks. Laboratory tests have shown that mere weight will not crush a brick wearing surface laid on a rigid foundation, provided the bricks have an even bed.

The plain sand cushion was objectionable because of the many hazards of construction. The old specifications gave elaborate directions for its compression, but engineers found that to obtain good results in actual practice was almost impossible, and that what was generally obtained was an unstable layer of sand, varying in compactness and thickness between a solid foundation and a solid wearing surface. It was also difficult to prevent the sand from working up between the joints of the brick wearing surface, and thus reducing the depth of the bond. This inequality of hardness of the material in the joints of the brick causes a shearing action, tending to crush the top of the bricks. There has also been the hazard of weather conditions. Rain falling upon the bricks before they have been rolled very often necessitates the relaying of the bricks, as it is likely to undermine the cushion and wash it into the joints.

SIDE VIEW OF FINISHED MONOLITHIC BRICK PAVEMENT BEFORE BUILDING SHOULDERS.

In view of these constructional hazards the engineers ask: "Why use a cushion; why not use a cement-sand bed with its many advantages?" The construction is simple. The cement and sand properly proportioned (a mixture of 1 cement and 4 sand being recommended) are placed, dry, in a machine or on a mixing board and thoroughly mixed until a uniform color is obtained. It is then spread, approximately 1 in. in thickness, on the prepared foundation, compressed with a roller weighing about 300 lbs., and struck off with a template to the true contour of the pavement. If any depressions develop they should be filled and the cement-sand bed again leveled and rolled. The bricks are immediately laid, inspected and rolled. The rolling must follow closely the laying, and all bricks laid must be rolled ~~before the~~ close of the day's work. It is not absolutely necessary to apply the cement filler the same day, for the brick surface is safe from the hazards of weather conditions as soon as it is rolled. The pavement should be thoroughly wet down with a spray just ahead of the grouting. This sets up the cement-sand bed and insures an even, solid bearing for the brick and at the same time practically joins the brick wearing surface and the foundation together. Thus we have a more or less monolithic construction.

The theoretical monolithic construction—but one which is also thoroughly practical and easily built—is obtained by laying the brick wearing surface directly on the freshly laid concrete foundation. The foundation is finished to the proper grade and contour by means of a simple wooden tamping or striking template of the proper cross section. This style of template can be easily moved along the side forms with a slight tamping motion, bringing the matrix of the concrete to the surface and thus forming a smooth, even bed of proper grade and cross section for the bricks.

If the street is too wide to allow the use of a template for its entire width, the foundation can be formed in sections, using the same style template on guiding strips set to the proper grade, and with small stools or bridges for the men to stand upon in the finished base. The strips and stools are easily moved from place to place, and the small depressions left in the finished base can be filled and brought to proper grade and contour by hand luting.

The laying of the brick follows closely. The brick should be laid, inspected and rolled before the cement has obtained its initial set.

For rolling the brick surface a hand-roller about 30 ins. long and 24 ins. in diameter and weighing from 600 to 900 lbs. should be used. The rolling should be kept close to the laying and be continued until a smooth surface is obtained. At the end of the day's work, the brick laying, inspection and rolling should be completed with the limit of the finished foundation.

One of the merits of this type of construction is that laying the concrete foundation and laying and rolling the brick are done at the same time, thus saving time in construction. By this method the improved pavement is ready for traffic in much less time than it would be if built according to the old method of construction.

For country road work or for improvements where an edging or flush curb is used, the laying of brick directly on the concrete foundation is strongly recommended, as thereby the edging or curb can be omitted, thus reducing the cost. Tests and practice have shown that the bond between the brick and the foundation is amply strong to protect the edges of the roadway from the shocks of traffic. Such a pavement has the additional merit of being noiseless.

The first monolithic brick pavement actually constructed for general service was built in Edgar County, Ill., in 1915 on a state aid highway. The specifications were drawn by an engineer of the Dunn Wire-Cut Lug Brick Co. and were approved by the State Highway Commission. A state highway engineer had general supervision, but the work was done under the immediate direction of the engineer of the Dunn Company who prepared the specifications.

The cement-sand bed type of construction has been adopted exclusively for brick pavements by the city of Baltimore, and it is coming into general use as fast as its merits become known. The monolithic type is being used extensively in state highway work in Illinois and Ohio, and on county roads in other states and on the Lincoln and Dixie Highways in Illinois.

These two types of brick pavements mark the most advanced steps, if not the only radical changes made during the past decade.

Testing Concrete in a Brick Rattler

Tests on the wear of concrete in a brick rattler were described by D. A. Abrams in a paper, entitled "A Method of Making Wear Tests of Concrete," presented at the recent annual meeting of the American Society for Testing Materials. The work is being done by Mr. Abrams at the Structural Materials Research Laboratory, Lewis Institute, Chicago, Ill.

The machine used is a brick rattler of the Talbot-Jones type. The concrete tested is molded into blocks with square, 8-in. faces and depths of 5 ins. The ten blocks constituting a test set are arranged around the perimeter of the drum and held in place by wooden wedges, the faces toward the inside forming a ten-sided polygon. The abrasive charge consists of about 200 lbs. of cast iron spheres, ten 3¾ ins. in diameter, and the remainder, about 133, 1⅞ ins. in diameter. These are placed inside the rattler and the end of drum covered with a heavy wire screen.

The test consists of the exposure of the blocks to the action of the spheres in the revolving drum for 3,600 revolutions at a rate of about 30 r. p. m. The best results, according to Mr. Abrams, are secured when the direction of the machine is reversed two or three times during a test. Each block is weighed immediately before running a test and again as soon as the test is completed, the loss in weight being considered the wear. This loss may be reduced to a percentage of the weight before testing or may be expressed as depth of wear, in inches. The latter method, Mr. Abrams stated, is preferable for the comparison of concretes of widely differing characteristics or for comparing concrete with other materials.

Up to the time of the presentation of the paper about 200 concrete blocks had been tested by this method, the tests having been made primarily for studying the action of the machine. The experimentors have studied the weight of shot to be used, the proportion of small and large spheres, the rate and number of revolutions, and the effect of the position of a block with reference to other blocks of the same or widely different characteristics. A few variations in mxture, aggregates, storage condtions, etc., have been made, but the scope of the tests is not considered sufficient to justify the presentation of results. The loss in weight of the blocks has varied from 8 to 25 per cent. Bricks have also been tested with concrete blocks, with satisfactory results. The blocks are proportioned and mixed separately, as only in this way, according to Mr. Abrams, can consistent results be secured. Metal forms made of 5-in. channels are used.

The advantages which this method of testing is believed to have are as follows:

"1—The concrete is subjected to a treatment which approximates that of service.

"2—The test piece is of usual form and of sufficient size that representative concrete can be obtained.

"3—The test pieces are convenient to make, store and handle, and require a relatively small amount of concrete.

"4—The cost of the test is not excessive.

"5—The machine used is found in numerous testing laboratories.

"6—The wearing action takes place on the top or finished surface of the concrete. This makes it possible to study the effect of various surface treatments or finishes.

"7—Several tests may be made at the same time, thus enabling more representative results to be obtained.

"8—Tests may be made on sections of concrete cut from roads which have been in service.

"9—Other paving materials such as brick, granite blocks, etc., may be tested in the same way as concrete."

"Drain! Drain!! and Drain Some More!!!"

By GEORGE C. WARREN*

The above has been in substance the prominent text of one of the most important features of publications of nearly every writer on road construction from John McAdam down to the present day. And yet I believe it is fair to say that, notwithstanding its extreme importance, it is the most shamefully neglected and given the least practical, actual, intelligent consideration and action by engineers in charge of road construction and the preparation of plans and specifications and the making of contracts therefor.

I believe it is not going too far to say that, in connection with country road construction, based on my thirty years' practical observation and experience, given any type of foundation and road surface, more trouble is caused by the effect of water resulting from poor or no sub-surface drainage and artificial excessive wetting of pavements than by either traffic or climatic conditions. I believe it is also fair to say that, with any character of "artificial foundation" for any type of road surface, one-third less depth of foundation with proper drainage is safer than the greater depth of foundation with inadequate or no drainage, natural or otherwise. And yet, generaly speaking, the drainage would cost much less than the additional cost of the increased depth of foundation or base.

I therefore beg to raise my voice in protest in the hope that something may be accomplished by way of radical and practical improvement in this respect.

DRAINAGE

In determining the question of the necessity for and character of drainage, the following are equally important features of consideration, each of which I propose to here discuss:

1. Climate.
2. Topography.
3. Character of subsoil.
4. Natural drainage.
5. Character of artificial drainage.

While this article is intended to refer chiefly to the drainage of the country road, it is also a fact that comparatively few cities give full or adequate consideration to the subject or to action based thereon.

Water is the enemy of all pavements, whether the water is applied through insufficient drainage or excessive and unnecessary street watering.

I believe that in my thirty years' experience in road and pavement construction in over four hundred cities of the United States and Canada, no city in the portions of those countries which are subjected to rigorous climate is as well paved or has had as great general success with pavements of all tried types, as has the city of Utica, N. Y., notwithstanding the extremely unfavorable local conditions of general spongy clay subsoil, excessively cold winters and excessive rain and snow fall. Aside from the quality of workmanship and engineering, I believe the chief causes of the unusual general success of pavements in Utica have been:

1. Universal drainage under the curb. This system was first inaugurated in 1886 by Richard W. Sherman, C. E., a brother of the late James S. Sherman, Vice President of the United States. At that time R. W. Sherman was city surveyor; later he was mayor.

2. Nearly universal dry cleaning of pavements without sprinkling.

The type of drain under the curb and the specifications therefor, as first adopted in Utica in 1886 and universally used since then, are as follows:

> TILE DRAINS
>
> A trench 12 ins. wide at the bottom and 18 ins. wide at the top shall be excavated on each side of the street under the curb to a depth of 3 ft. below the top of the proposed curb grade (equal to 2 ft. 6 ins. below the surface of the pavement), the back of the trench to be 10 ins. from the edge of the roadway, and a line of hemlock plank, not less than 1 in. in thickness or 6 ins. in width, shall be carefully bedded in the bottom of the trench. On this as a foundation there shall be laid a brick tile drain, composed of a sole tile of 3 ins. internal diameter, or a horse-shoe tile of 3 ins. internal diameter and 3 ins. internal height; such tile drains to connect with catch basins or sewer, as the engineer may direct. The joints of the tile shall be carefully covered with tarred paper.
>
> After the tile shall have been laid, the trench shall be filled with clean cobbles or broken stone. The cobble or stone filling shall be carefully and firmly placed in the trench, in such a manner as not to injure the tile drain. On top of this cobble or stone filling shall be placed about 1 in. of small broken stone free from dust, over which is spread a layer of loam, preferably of a clayey nature, to a depth of about 2 ins.
>
> In bidding on the item, "Tile Drains," bidders will bid price "per lineal foot of tile drain," which shall include the necessary excavation, 1-in. plank, tile and stone filling.

Generally speaking, the installation of artificial drainage is more important on country roads than city streets because:

(a) Under the city streets there are sewers and other subsurface mains and laterals, the trenches of which, to a greater or less extent, assist in subsurface drainage.

(b) Abutting sidewalks and buildings lessen the chance of water working under the pavement from the outside.

In a paper read before the "International Good Roads Congress" held at Montreal in March of the present year, Col. William D. Sohier, Chairman of the Massachusetts Highway Commission, in making a very broad "assumption," makes the following timely statements:

> I must also assume that the road has been constructed with adequate drainage, as without the necessary drainage any road will soon be destroyed and will become a series of bog holes and ruts with a horse path in the middle, full of mud; and that does not constitute a road, even if we do have to travel over many miles of such abominations in both countries.
>
> The best argument for a good road is the road itself. Get busy; build the best road you can afford to build; locate well; secure sufficient width of location; drain it well and grade it well with proper materials.
>
> If you can afford it, put on a surface suitable for the traffic that uses the road and keep that constantly maintained.
>
> One mile of road in good order is a better argument for good roads, and will produce more votes and more money and more good roads advocates in one year, than all the conventions and learned speeches that have ever been held and delivered in the last thirty years.

Col. Sohier's whole article is commended to all interested in road construction.

The "important features for consideration," in the order previously outlined, are discussed in the following paragraphs:

1.—Climate

It is self-evident that in Southern and Pacific Coast climates where there is little or no frost there is far less trouble from lack of drainage than in the rigorous climates of the North. The greatest trouble from poor foundation or poor drainage occurs during the spring thaws under the combination of water-soaked (and consequently weakened) subsoil, and traffic. Probably there has been no season so severe on road construction during the past quarter of a century in New England as the last half of last winter and early spring. During that period there was not only the heaviest snow-fall and greatest depth of frozen ground of many years, but instead of the usual "spring thaw" there were no less than three "spring thaws" between February 1 and April 15, with the result that every important thoroughfare having a combination of inadequate drainage and foundation was "put out of business," including roads which had developed no defects under normal conditions for two to four or more years. The consequent damage to roads was doubtless many times the amount which at the times of original construction would have provided all the additional drainage and foundation necessary to have prevented the subsequent collapse.

---

*President, Warren Brothers Company.

2.—Topography

If the road surface is well above the abutting land on both sides there will probably be no trouble from lack of drainage unless the subsoil is unusually spongy.

If, on the other hand, the abutting land on either or both sides is materially above the level of the roadway, then the subsoil of the road is likely to intercept not only surface drainage seeping under the road, but subdrainage from springs, etc., under the high ground at the side or sides. Of course, if the abutting property is of a boggy nature, extensive subdrainage is absolutely necessary.

3.—Character of Subsoil

If the subsoil is gravel or sand of considerable depth it is probable that it will provide a natural subdrainage which will overcome the necessity of artificial drainage, but it is still safer and, in the long run, more economical, to provide drainage in cases of unfavorable topography.

If on the other hand the subsoil is clay which will readily absorb but never give up water, then side and cross drain are necessary regardless of the type of road foundation or surface.

4.—Natural Drainage

This topic has been largely anticipated by the matter under the topics "Topography," and "Character of Subsoil," but it remains to urge the safe side of caution. And, if there is any doubt, then provide artificial drainage.

5.—Character of Artificial Drainage

Some engineers advocate the placing of a subsurface drainage course of gravel or crushed stone under the entire surface of the road foundation. This is quite costly and, in the writer's opinion, is generally not only unnecessary but likely to be an injury to the construction by providing a sort of watercourse and reservoir under the entire area of the road, which is an element of weakness instead of safety. Even clay provides a good subsoil for any adequate type of "artificial foundation," provided only that the clay itself is well drained by side drains and cross drains at intervals.

In the case of swampy land at the side, a more or less elaborate system of pipes of sizes dependent on the extent of the swampy condition becomes quite essential. This, however, is quite infrequently encountered and the aggregate expense of meeting such conditions, balanced over the entire road mileage of a community, is quite small although constituting a high cost per thousand linear feet of such conditions encountered.

Ordinarily, when drainage is required to overcome underground or surface seepage, it is merely a matter of a trench on one or each side of the road (depending on the topography) to a depth of two to three feet, with a "porous tile" say 3 in. in diameter at the bottom. The trench should be filled with field or other most available stone, say 4 to 8 ins. in size, hand placed in the trench with reasonable care. The top of the trench should be covered with crushed stone or screened gravel and topped off with clay to prevent sand, etc., from washing into the drains substantially according to specifications outlined for the curb drain adopted in Utica, N. Y.

If the conditions are such that the side drains thus constructed cannot be connected with catch basins, culverts or sumps at intervals of say 200 ft., it becomes necessary to provide cross drains of similar construction at intervals of say 200 ft. connecting such cross drains with the land at the low side of the road. It seldom happens that these outlets cannot be provided at the proper intervals at one side or the other.

It will be understood that the foregoing is intended only to outline the plan of drainage in very general terms, the dimensions and the details of the problem being matters for study by the engineer in connection with the conditions on each section of each road.

It may seem to the general reader that most of what is said above is merely the "A B C" of road construction. I am free to admit that it should be such in practice and that it is in reality not a complicated matter. But as noted at the outset, it is, for some inexplicable reason, the first thing a writer refers to, but, with nearly equal certainty, the one thing the average engineer overlooks in making his plans and specifications. Perhaps the low available appropriation per mile is one of the chief causes for this neglect, but if that is the case then it is better to build less miles and build them in a manner which will prove to be a credit and pride to the community, and it will in nine cases out of ten vote the necessary appropriation for additional mileages.

The public still needs education to the fact that roads at low mileage cost, to meet modern and rapidly increasing traffic conditions, are impossible. In the writer's judgment the best, quickest and most economical and practical means of such education is by building thoroughly as far as you go, and thus prove the efficiency. The additional appropriations to extend the recognized improvement will then be readily forthcoming.

Major W. W. Crosby, Consulting Engineer, Baltimore, Md., who was for many years the efficient Chief Engineer of the Maryland State Highway Commission, delivered in March, 1916, at the "International Good Roads Congress" in Montreal, an extremely valuable paper on the subject, "Road Drainage and Foundations," the whole of which should be read and digested by every road engineer and contractor. Just by way of samples, to create a demand for the whole, I will take the liberty of here quoting four paragraphs as follows:

> It will be assumed that the "drainage" referred to in the title is that provision made for taking care of the water so as to improve the foundation or protect it from injury, and is not intended to cover provisions to be made for the disposal of surface or storm water to be cared for in any event. Drainage therefore becomes a consideration in this paper incidental to foundations and reference to it will be made along these lines instead of by attempting the really impracticable separate consideration of it. * * *
>
> Drainage thus enters into the consideration of the foundation. If for no other reason, drainage must be provided in order that water shall not by its advent into the foundation injure the supporting power of the latter seriously. Again, if the amount of water normally present in the foundation is weakening its supporting powers, drainage may be provided to take away this water and thus at a moderate expense frequently to render satisfactory the natural foundation material, as well as to protect it from further weakening against the advent of more water under abnormal or exceptional conditions. * * *
>
> So much has been said and written regarding the details of drainage that the writer will not attempt to go into these matters again here. He believes that, if he has made intelligible the reasons for drainage in connection with foundations, his readers will be perfectly well able to work out the details of construction for themselves. He would simply add one word of caution, and that is, the drainage provisions in every case should be not merely sufficient for the conditions existing at the time, but should be ample to take care of any conditions that may seem possible of occurrence. * * *
>
> Old pavements have frequently been used as foundations for new pavements and in some cases, an artificial foundation in the shape of a stone pavement, has been provided for the new pavement. Such foundations are of considerable antiquity. The telford pavement as a base for a macadam surfacing is a well known instance. There are many cases in cities of this

country where the streets were originally paved more or less roughly with stone blocks, or so-called cobble stones, and these old pavements used, with or without relaying, as foundations for pavement surfacings. Various degrees of satisfaction have resulted. Properly laid, the supporting power and stability of such foundations is relatively high and in many cases under the local conditions, their use has been economical. On the other hand, in some cases, the development of traffic conditions has resulted in such severe strains on these foundations that they have failed, and have had to be replaced by the more substantial concrete slab. Probably most of the failures of these pavements as foundations have come through the lack of evenness of surface obtainable on them, and a consequent lack of uniformity in the thickness of the pavement surfacing.

FOUNDATIONS

While somewhat foreign, although closely related, to the subject of "drainage," a brief paragraph on the subject of foundation seems opportune.

Many engineers and others have an idea that whatever may be the climatic, drainage, subsoil or other present road conditions, modern high-class reconstruction or new construction must, per se, include a Portland cement concrete base. Unfortunately, we find the present intrenched combination of cement manufacturers with their "per barrel assessment on output" aggregating hundreds of thousands of dollars in the United States "promoting" such a sentiment and bringing to bear every ingenious and fallacious argument "known to the art" in order to increase the cement output. Consequently, in every community having macadam roads providing adequate foundation in part or whole for suitable wearing surface we find a swarm of advocates of tearing out the macadam and, at excessive and unnecessary expense, supplying concrete base for the proposed construction of the roads to meet the modern automobile traffic. It has been abundantly proven that with adequate drainage, such macadam roads provide an entirely adequate and most economical foundation for a new, high-grade, modern road surface, the use of which will save from $10,000 to $15,000 per mile of road reconstructed, depending upon the width of the road and depth of present road metal. Of course, the new road surface must of itself have reasonable and proper solidity and stability.

In this connection when it is proposed to utilize an old macadam road as a foundation or base for new surface it is quite essential that as the work progresses test holes, generally at 100-ft. stations, more frequently if necessary, should be cut through the macadam to prove:

(a) The depth and solidity of the macadam;

(b) The character and drainage of the subsoil.

Generally speaking, 4 to 6 ins. of solid, undisturbed old macadam resting on well-drained subsoil will be ample.

If the old macadam in any part of the road proves to be too thin, it should still be disturbed as little as practicable and built up by the use of new stone (paid for at agreed price per cubic yard) to provide the necessary depth and solidity. It is not sufficient to assume that a road which appears hard and solid at the surface during the summer season of construction is sufficient to provide a solid base for a new road surface at all seasons. It is, however, safe to assume that such solid appearing road surface does provide a base for a foundation which can be most economically provided by conserving and building up what exists and not by tearing it out and discarding it.

On this subject, Francis P. Smith, Ph.B., in a paper read before the "International Road Congress" in Montreal, March, 1916, says:

> Before using any macadam road as a foundation, its history, and more particularly its condition in the spring of the year, should be investigated. A sufficient number of test holes should be put down to determine the character and depth of the stone and provision made for proper under and side drainage. It will usually be necessary to rebuild the road in a number of places and in most instances the crown must be reduced. Wherever possible this should be done by filling up the depressions and building up to the shoulders. Traffic will compact a road far better than will a roller and a road surface which has been scarified and rolled will not be as hard and firm as one which has been compacted by years of traffic. Where depressions are to be filled the roadbed should be cleaned and slightly loosened to insure proper binding of the new stone, which should be of the same size as would be employed in building up the corresponding portion of a new macadam road. It should be thoroughly wetted and rolled with a 10-ton road roller with the addition of sufficient screenings until vehicles passing over it do not cause displacement.
>
> Unless this work is thoroughly and conscientiously done, the foundation will not be of uniform strength throughout, and settlements will occur where the new stone was put. If it is necessary to scarify the road surface this should be done to the minimum possible depth, after which the surface should be built up exactly as if constructing a new macadam road and rolled until the utmost compaction is obtained. Wherever possible traffic should then be turned upon the road for a few months to develop any weak spots in it, and to secure still better compaction.
>
> Old pavements of brick, granite, etc., should not be used as a base if it is first necessary to re-set them. In their original condition they are satisfactory if the traffic is not too heavy. Relaid blocks, until bedded by traffic, are not rigid, and have a tendency to rock, and asphalt pavements laid on such foundations in New York City have rapidly disintegrated wherever they were exposed to heavy traffic.

"California Highway Bulletin" for July

The July issue of the "California Highway Bulletin," the official publication of the Highway Commission, is an unusually interesting and instructive number. It is of the usual size of page, but is printed as a "folder." One side of the 25 by 38-in. sheet on which it is printed carries a large scale road map of the state. The other side is occupied by eight pages of text. The sheet is folded lengthwise with the map on the inside and then folded the other way so that the pages are in order as turned.

The text of the bulletin includes several articles on the work of the commission and is profusely illustrated by excellent halftones. Among the more important articles are the following:

"Overhead;" "The Great Short Cut over Tehachapi Mountains;" "Eliminating the Terrors of the Bell Springs Grade;" "Story of the Great Yolo Basin Concrete Trestle;" and "Convict Laborers on the Mountain Laterals."

The map shows the state highway system upon which the commission has been working for several years. Paved roads are indicated by solid black lines, graded roads by black dots, and roads surveyed by solid red lines. Roads of which only reconnoissance surveys have been made are indicated by broken red lines.

Below the map are printed three brief statements. One summarizes what the commission has already done with its expenditures from the $18,000,000 bond issue. Another is an outline of what it is proposed to do if the $15,000,000 additional bond issue is voted next fall. The third is addressed "to the people of California" and explains in some detail the financial phase of the state highway work.

Wisconsin Road Map

A map showing the principal highways of Wisconsin was issued last month by the Highway Commission of that state. The map is drawn on a scale of 16 miles to the inch and is folded inside of a cover 4½x7½ ins. in size. The roads shown comprise the principal thoroughfares in the state. The main highways forming through routes of intercountry travel are indicated by wide red lines, the secondary lines of travel by narrow red lines, and the secondary lines of doubtful passability at certain seasons, by dotted red lines. The roads indicated, according to the explanatory paragraphs accompanying the map, are believed to be the best practicable and most commonly used routes between various points.

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TAX BURDENS AND BOND ISSUES

"Tax Burdens Increased by Great Bonded Debt," a paper by State Controller John S. Chambers of California, printed elsewhere in this issue, is well worth the attention not only of road builders but also of every taxpayer and every voter.

The paper includes, besides statistics referring chiefly to California, a brief but pointed discussion of the ethics and economics of bond issues. The paper needs little emphasis; but attention should be drawn to the fact that the author does not condemn all bond issues, a meaning which might perhaps be read into the paper by a hasty perusal. As a matter of fact, Mr. Chambers endorses the proposed $15,000,000 road bond issue which will come before the voters of California in November. He has advocated the measure in public addresses and has placed himself on record as believing that issue to be among those for which the need is imperative.

So much has been said and so much written in regard to bond issues for road work that only by reiteration can stress be put upon some of the principal points to be considered in connection with this particular method of financing improvements. These are outlined in the latter part of Mr. Chambers' paper.

Nothing is further from the purpose of "Good Roads" than to discourage road improvement through the issuing of bonds to meet its cost, but at the same time we have always advocated the careful study of any proposed plan of bonding.

It is very plain that the amount of road work which should be done at once is too great to be paid for out of current revenues and the bond issue seems to furnish the way out of the difficulty. In most cases it is quite feasible to issue bonds; and by the exercise of good judgment a working plan can be made which will be open to little if any objection.

There is no doubt that in the past funds derived from the sale of long-term bonds have been used for work of the most temporary nature. This, of course, is indefensible in almost all cases. On the other hand, there is much work which is as nearly permanent as any work can be, which can be undertaken only if bonds are issued to meet its cost. In almost all instances certain portions of the work can legitimately be paid for by the sale of bonds and the remainder taken care of with funds from current revenues, or perhaps left to be done at some future time.

GOOD ROADS, POLITICS AND ENGINEERS

Every little while we are called upon to note the dismissal of some engineer from a post of responsibility in the administration of road or street work. Sometimes the separation of the official from his work is well deserved; more often it is no more nor less than the surface evidence of the workings of political intrigue. It is perhaps trite to draw a moral from such happenings, yet every protest against an evil is potentially at least a step toward better things.

The latest instance of the bane of too much politics in road work comes from Kentucky where the state highway commissioner, Robert C. Terrell, has been let out by Governor Stanley because, according to the best information obtainable, he was not sufficiently active politically.

There is no evidence to show that he lacked in either the administrative or the engineering ability to build roads. On the contrary, his efficency and faithfulness seem to be generally recognized, and it appears that he was dismissed not because he did not build good roads, but because he couldn't—or more likely wouldn't—build political fences or mend those that others built.

That in this instance an able man has been selected to succeed the victim of the political headsman is of no moment, has no bearing on the ethics or the economics of the case. In similar occurrences in the past, as good—and sometimes better—men have succeeded some sacrifice on the altar of partisan politics, but in our humble opinion such accidents—and we use that word advisedly—have not excused the offenders against good government.

We know of no reason why the ratio of the number of honest and efficient highway engineers to the total number of highway engineers should not be the same in each political party. We realize, too, that the limitations of human nature are such that it is impossible to keep road building or any other public work entirely free from politics. Only fanatics and idealists expect that. So long as the world has to muddle along under the guidance of finite and selfish minds so long will other factors than men's fitness influence and sometimes determine their selection to do the world's work. On the other hand it is possible to secure reasonably able and conscientious men to administer our public affairs and to insure their tenure of office during good behavior and the efficient performance of their duties.

Bringing about the enactment of laws to make possible such results is one of the most important duties facing highway engineers. Heretofore they have as a class, had too little to say in the forming of laws—they have held back from participating in such work, as they have from taking an active interest in many other public questions.

THE STREETS OF SMALL CITIES AND LARGE TOWNS

It would seem superfluous to call attention to the fact that continuous maintenance is as necessary for the streets of the smaller cities and the larger towns as it is for country roads, yet it is true that in some sections the main country roads are in much better condition than are the city and village streets. Automobilists are well aware of this, for it is forced upon their notice every time they enter or leave any settlement of sufficient size to be entrusted with the care of its own highways.

A New England town which serves admirably as an example of this condition was recently visited by the writer. It is an ordinarily prosperous community of some eight or nine thousand inhabtants; it is ideally situated in a region of great natural beauty; it has fine water power, an unexcelled water supply, and many other natural advantages. It is served by two railroads and is the home of several large manufacturing concerns. It has an active and growing organization of business men, and within the past fifteen years has become an important summer resort. It has several unusually fine churches, good schools, and a well equipped library. Its fire department is efficient, its streets are well lighted and there are sidewalks on most of the principal thoroughfares.

But the condition of its streets is indescribably bad. With the exception of a short stretch of bituminous macadam resurfacing on the main street, there is hardly a mile of even passably good roadway in the town proper. Almost every roadway is a succession of ruts and waves that make it very uncomfortable to ride in any kind of vehicle, even at a very slow speed. The main street through which runs a single track, T-rail, street car line, is about as bad as it could be and remain passable. It is even rougher than the other streets and as it has been oiled—apparently without preliminary cleaning—it is a sea of oily slime in wet weather. Unflattering as this description may seem, it is conservative rather than overdrawn. And the town would suffer little in comparison with some of its neighbors.

Given the existence of such conditions, it is natural to inquire why they should be as they are. The answer is not easy to find. Although the streets in cities and towns are generally exposed to more severe service conditions than those obtaining upon country roads, there is no reason why the principal thoroughfares should not be kept in fairly good shape. Even a comparatively small outlay for patching would work wonders in many cases, while for an expenditure of not over a dollar a square yard a reasonably satisfactory job of resurfacing usually could be done.

Whatever the reason for the apparent apathy of small town and city officials, the results are deplorable. Traffic should be as well accommodated within communities as between communities, and it is difficult to understand why there should not be enough civic pride among the citizens of our smaller municipalities to refuse to tolerate such street conditions as exist in many small cities and large towns.

American Built Steel Highway Bridge in Chapei District, China.

The Commerce Report issued by the United States Department of Commerce notes the construction of a typical American steel highway bridge in China. The structure spans Soochow Creek on what is known as the Stone Bridge Road, in the Chapei District.

Heretofore English rather than American practice has been followed in the construction of steel bridges in China, especially with regard to the height of the truss and the length of the panel which ordinarily is somewhat shorter than is customary in America.

The new bridge has a length of approximately 200 ft. The "Far Eastern Review" has this to say about it:

"This bridge was purchased under an order from the Chapei (Chinese) Municipal Council and was manufactured by one of the constituent companies of the United States Steel Products Co., of New York and Shanghai. The ease and rapidity with which it was erected speaks well not only for the skill of the Chinese erectors, but also for the type of the structure and the manufacturer's work. It was not assembled prior to shipment, but the accuracy with which all the parts came together when assembled in the field was all that could be desired. It is, therefore, a good example tending to illustrate that American bridge shop methods insure accuracy of fit in the field, even though the bridges are not completely shop erected."

NEWS NOTES

The Ohio State Department of Automobile Registration reports that the receipts of the department during the fiscal year ending June 30, were $1,200,237. Of this amount the State Highway Department will receive approximately $1,100,000.

San Antonio, Tex., has included these items in a $1,651,581 budget: Street superintendent, $85,000; street cleaning and sanitation, $153,540; widening and paving streets, $34,700; parks and plazas, $67,100; engineering, $30,000; total $370,340.

The Reduction of the Thickness of Gravel Wearing Surfaces on Bridge Floors in Minnesota, where necessary, is urged in an article in a recent issue of the "Minnesota Highway Journal." It is stated that with few exceptions all plans for new steel highway bridges made by the State Highway Commission call for concrete floors. These floors, it is stated, should be covered with gravel wearing surfaces as should also the floors of all reinforced concrete bridges. While it is very important that this covering be thick enough to protect the slabs it is also important to prevent making it so thick as to overload the bridge. On those structures where the extra weight would not be a serious matter the commission's plans call for gravel 4 ins. thick at the curbs and 5 ins. thick at the center of the roadway. But on truss bridges, according to the article, the gravel should be only 2 ins. thick at the sides and 4 ins. at the center. It is pointed out that it is not uncommon to find truss bridges on which the gravel is placed even with the top of the curb and at an even greater depth at the center, giving an average thickness of 9 ins. The author of the article figures the weight of each inch of gravel covering on the floor of a 100-ft. truss bridge with an 18-ft. roadway at 8.4 tons, and it is pointed out that a 6-in. extra thickness on such a bridge means an unnecessary weight of over 50 tons.

Directory of State Highway Officials

Supplementing the review of highway work in the various states, printed on other pages of this issue, there are printed in the following pages the names and titles of the chief highway officials in each of the several states. The names given for those states which have no highway departments are those of the officials of the state government most directly concerned with the administration of road work. A few of the states have no officials having any connection with road work, and under the names of such states are printed explanatory paragraphs.

As a rule, the addresses of officials and engineers of state highway departments, with the exception of division, resident and assistant engineers, are the same as that of the department. In some special cases, however, other addresses are given for members of the commissions or the staffs.

ALABAMA

State Highway Commission, Montgomery: Robert E. Spragins, Chairman; John Craft, J. B. Rylance, Dr. Eugene A. Smith, (State Geologist); G. N. Mitcham, (Professor of Engineering, Alabama Polytechnic Institute).

State Highway Engineer, W. S. Keller; Assistant State Highway Engineer, R. P. Boyd.

ALASKA

Board of Road Commissioners, Valdez: President, Colonel W. P. Richardson, C. E., U. S. A.; Secretary and Disbursing Officer, Major P. C. Davison, U. S. A.; Engineer Officer, Lieutenant J. C. Mehaffey, C. E., U. S. A.

ARIZONA

State Board of Control, Phoenix: Ex-officio, Governor George W. P. Hunt and State Auditor J. C. Callaghan; Chas. R. Osburn, Secretary.

State Engineer, Lamar Cobb.

Office Engineer, T. F. Nichols.

Chief Clerk, E. P. Adams.

Division Engineers: J. S. Barlow, J. C. Ryan, F. G. Twitchell and Frank R. Goodman.

ARKANSAS

State Highway Commission, Little Rock: William B. Owen, Commissioner of State Lands, Highways and Improvements, ex-officio Chairman; Guy B. Tucker, Thomas Burress, Jno. Harris, Deputy Commissioner of State Lands.

Secretary, Ben Spires.

State Highway Engineer, H. R. Carter.

CALIFORNIA

State Highway Commission, Sacramento: Charles D. Blaney, Chairman; Newell D. Darlington, Charles F. Stern.

Secretary, Wilson R. Ellis.

State Highway Engineer, Austin B. Fletcher; First Assistant Highway Engineer, George R. Winslow; Second Assistant Highway Engineer, Lester H. Gibson; Assistant Highway Engineer, W. Lewis Clark.

Attorney, Charles C. Carleton; Purchasing Agent, R. C. Penter; Chief Accountant, John H. Small; Geologist, Clarence B. Osborne.

Division and Assistant Division Engineers: Division 1—F. G. Somner, Division Engineer, Willits; F. W. Haselwood, Principal Assistant Engineer, Willits. Division 2—T. A. Bedford, Division Engineer, Dunsmuir; R. H. Stalnaker, Principal Assistant Engineer, Dunsmuir; H. S. Comly, Assistant Division Engineer, Dunsmuir. Division 3—W. S. Caruthers, Division Engineer, Saramento; T. E. Stanton, Jr., Assistant Division Engineer, Sacramento; S. S. Stahl, Assistant Division Engineer, Sacramento. Division 4—A. E. Loder, Division Engineer, San Francisco; R. K. West, Principal Assistant Engineer, San Francisco. Division 5—W. C. Howe, Division Engineer, San Luis Obispo; A. A. Peters, Assistant Division Engineer, San Luis Obispo; George Mattis, Assistant Division Engineer, San Luis Obispo. Division 6—J. B. Woodson, Division Engineer, Fresno; D. Chamberlin, Assistant Division Engineer, Fresno. Division 7—W. W. Patch, Division Engineer, Los Angeles; S. V. Cortelyou, Assistant Division Engineer, Los Angeles; E. E. East, Assistant Division Engineer, Los Angeles.

Advisory Board: Governor Hiram W. Johnson; J. J. Dwyer, President, State Board of Harbor Commissioners; F. W. Hatch, General Superintendent of State Hospitals; W. F. McClure, State Engineer; Messrs. Blaney, Darlington and Stern (of the Commission) appointed members.

COLORADO

State Highway Commission, Denver: State Highway Commissioner, T. J. Ehrhart; Secretary-Engineer, J. E. Maloney.

Advisory Board, Denver: J. M. Kuykendall, Chairman; L. E. Curtis, Vice Chairman, Colorado Springs; F. Radford, Trinidad; F. Goble, Silverton; L. Boyd Walbridge, Meeker.

CONNECTICUT

State Highway Commission, Hartford: State Highway Commissioner, Charles J. Bennett; Deputy Highway Commissioner, Richard L. Saunders; Superintendent of Repairs, W. Leroy Ulrich.

Division Engineers: Robert W. Stevens, Hartford; Elmer C. Welden, Norwich; Carroll A. Campbell, Middletown; George E. Smith, New Milford; Robert S. Hulbert, Winsted; Orrin W. Head, New Haven.

Supervisors of Repairs: Jedediah Deming, Hartford; F. W. Pratt, West Willington; R. E. Donnelly, Bridgeport; B. A. Cooke, New Haven; E. P. O'Brien, Naugatuck; H. H. Davenport, Pomfret; M. F. Mulville, Norfolk; D. R. Kane, Deep River; A. C. Innis, New Milford.

DELAWARE

Kent County—County Road Engineer, W. Hart Scott, Dover.

New Castle County—State Highway Commissioner and County Engineer, James Wilson, Wilmington.

Sussex County—County Road Engineer, Morgan T. Gum, Georgetown.

DISTRICT OF COLUMBIA

Engineer Department: Engineer-Commissioner, Major Charles W. Kutz, U. S. A.

Chief Clerk, Daniel E. Garges.

Surface Division: Capt. J. J. Loving, Assistant to Engineer-Commissioner, in charge; Engineer of Highways, C. B. Hunt; Superintendent of Streets, H. N. Moss; Superintendent of Suburban Roads, L. R. Grabill; Engineer of Bridges, D. E. McComb; Superintendent of Street Cleaning, J. W. Paxton; Inspector of Asphalts and Cement, J. O. Hargrove; Surveyor, M. C. Hazen; Superintendent of Trees and Parkings, Trueman Lanham.

Assistant Engineers: J. W. Dare, G. V. Rector, A. S. Fennell, W. W. Curtis, A. S. Fernald, E. G. Emack, O. B. Magruder, T. J. Powell and S. J. Gass.

FLORIDA

State Road Department, Tallahassee: Ed. Scott, Chairman, First Congressional District; Secretary, J. D. Smith, Third Congressional District; F. O. Miller, State at large; W. J. Hillman, Second Congressional District; M. M. Smith, Fourth Congressional District.

State Road Commissioner, Wm. F. Cocke.

Chief Clerk and Assistant Secretary, J. P. Clarkson.

GEORGIA

There is no central authority having charge of road work in Georgia. The Prison Commission has supervision over the state convicts who are used on road work, though the commission exercises no authority over the work done by the prisoners. In the past, both the Prison Commission and the Geological Department have collected data on road work in the state.

Prison Commission of Georgia, Atlanta: Chairman, R. E. Davison; Commissioners, T. E. Patterson, E. L. Rainey.

Secretary, G. H. Yancey.

State Highway Supervisor (appointed by the Prison Commission), Thomas P. Stanley.

State Geological Department, Atlanta: State Geologist, S. W. McCallie; Assistant Geologists: J. E. Brantley and H. J. Shearer; Chemist, Edgar Everhart.

IDAHO

State Highway Commission, Boise: W. A. Brodhead, Chairman; E. A. Van Sicklin; Secretary of State George R. Barker, Secretary.

State Highway Engineer, E. M. Booth.

ILLINOIS

State Highway Commission, Springfield: A. D. Gash, President; S. E. Bradt, Secretary; James P. Wilson.

Chief State Highway Engineer, W. W. Marr; Road Engineer, H. E. Bilger; Assistant Road Engineer, M. W. Watson; Bridge Engineer, Clifford Older; Assistant Bridge Engineer, G. F. Burch; Maintenance Engineer, B. H. Piepmeier; Assistant Maintenance Engineer, F. T. Sheets; Testing Engineer, F. L. Roman; Office Engineers, C. M. Hathaway, A. W. Consoer; Chief Draftsman, L. P. Scott; Chemist, W. C. Adams; Chief Clerk, J. M. McCoy.

Division Engineers: R. L. Bell, Paris; H. B. Bushnell, Aurora; J. E. Huber, Mt. Vernon; A. H. Hunter, Peoria; C. M. Slaymaker, E. St. Louis; H. E. Surman, Moline; Fred Tarrant, Springfield.

INDIANA

There is no central authority having charge of road work in Indiana, the work being done entirely under the supervision of the local authorities.

IOWA

State Highway Commission, Ames: Commissioners: J. W. Holden, Chairman; H. C. Beard; A. Marston.

Chief Engineer, Thos. H. MacDonald; Assistant Chief Engineer, C. B. McCullough; Road Engineer, F. R. White; Bridge Engineer, J. H. Ames; Assistant Road Engineers, J. S. Dodds, W. E. Jones; Assistant Bridge Engineer, E. F. Kelly; Chief Draftsman, J. A. Paulson.

District Engineers: District 1—C. Coykendall, Ames; District 2—W. H. Root, Mason City; District 3—W. F. Beard, Ames; District 4—L. M. Martin, Atlantic; District 5—J. S. Morrison, Ottumwa.

KANSAS

Office of State Engineer, Kansas State Agricultural College, Manhattan; State Engineer, W. S. Gearhart; Drainage and Irrigation Engineer, H. B. Walker.

Assistant Engineers: A. R. Losh, C. I. Felps and W. J. King.

KENTUCKY

Department of Public Roads, Frankfort: Commissioner of Public Roads, R. Wiley; Bridge Engineer, ——— ———. Assistant Engineer, Frank Duffy; Chief Clerk, Joe M. Kendall; Accountant, L. O. Taylor.

Division Engineers: J. F. Grimes, M. D. Ross, W. L. McDyer, W. A. Oberchain, Shirley Cunliff, T. B. Smith, H. E. Read, L. T. Haney, T. B. Webber, Walter F. Brooks, John A. Whittaker, R. E. Toms.

LOUISIANA

Board of State Engineers, Highway Department, New Orleans: State Highway Engineer, W. E. Atkinson; Assistant Engineer, C. M. Kerr; Engineer of Construction and Maintenance, Lewis T. Gilmer; Secretary, Charles F. Wood; Office Engineer, C. G. Cappel; Draftsman, E. G. Sandoz.

Resident Engineers: T. S. Shields, Baton Rouge; H. T. Richardson, Hammond; H. C. Daigre, Shreveport; W. H. Norckauer, Baton Rouge; E. J. C. Burroughs, Columbia; C. A. Spencer, Shreveport; H. H. Holloway, Bunkie; W. P. Reymond, Jr., Lafayette; L. J. Daigre, Georgetown.

MAINE

State Highway Commission, Augusta: Chairman, Philip J. Deering, Portland; Wm. M. Ayer, Oakland; Frank A. Peabody, Houlton.

Chief Engineer, Paul D. Sargent, Augusta.

Assistant Engineers: I. W. Barbour (in charge of State Highways), Augusta; L. D. Barrows (in charge of State Aid), Augusta; A. J. Wiggin (in charge of Maintenance), Augusta; G. F. H. Bragdon, Augusta.

MARYLAND

State Roads Commission, Baltimore: Chairman, Frank H. Zouck; Clinton Uhl, John B. Mudd.

Secretary, Clyde H. Wilson.

Chief Engineer, Henry G. Shirley; Engineer of Surveys, John N. Mackall; Assistant Engineer, B. P. Harrison; Maintenance Engineer, A. F. Shure.

Resident Engineers: R. W. Owens and C. S. Gale, Washington, D. C.; W. F. Childs, Jr., Salisbury; Gault Applegarth, Chestertown; C. A. Tenney, Frederick; L. T. Downey, Cumberland; E. H. Wroe and E. Friese, Baltimore.

MASSACHUSETTS

Highway Commission, Boston: Chairman, Wm. D. Sohier; Frank D. Kemp; James W. Synan.

Secretary, Frank I. Bieler.

Chief Engineer, Arthur W. Dean; First Assistant Engineer, Andrew M. Lovis.

Division Engineers: C. H. Howes, Greenfield; J. A. Johnston, Springfield; F. C. Pillsbury, Boston; W. R. Farrington, Middleboro.

MICHIGAN

State Highway Department, Lansing: State Highway Commissioner, Frank F. Rogers; Deputy State Highway Commissioner, Leroy C. Smith.

Bridge Engineer, C. V. Dewart.

Assessment District Engineer, L. H. Belknap.

Office Engineer, J. H. Bateman.

Chief Draftsman, H. L. Brightman.

District Engineers: G. C. Dillman, Escanaba; L. H. Neilsen, Cadillac; William W. Cox, Kalamazoo; L. D. Townsend, Lansing; R. W. Roberts, Saginaw; E. K. Lovelace, Lansing; T. O. Williams, Grand Rapids.

MINNESOTA

State Highway Commission, St. Paul: C. M. Babcock, Chairman; F. B. Lynch; Clarence I. McNair.

Secretary and State Engineer, George W. Cooley.

Deputy Engineers: Roads, John H. Mullen; Bridges, Carl E. Nagel.

Chief Clerk, S. C. Notestein.

MISSISSIPPI

State Highway Commission: Chairman, J. M. McBeath, Meridian; D. W. Robins, Tupelo; Secretary, W. T. Denman, McComb.

State Highway Engineer, Xavier A. Cramer, Magnolia.

MISSOURI

State Highway Department, Jefferson City: Frank W. Buffum, State Highway Commissioner; E. W. Sheets, Deputy State Highway Commissioner.

MONTANA

State Highway Commission, Helena: Ex-Officio, State Engineer A. W. Mahon; L. D. Conklin.

Secretary and Highway Engineer, George R. Metlen.

Bridge Engineer, C. A. Kyle.

NEBRASKA

State Board of Irrigation, Highways and Drainage, Lincoln: Governor John H. Morehead, President; Attorney General Willis E. Reed; Commissioner of Public Lands and Buildings Fred Beckmann.

State Engineer, George E. Johnson; Assistant State Engineer, W. D. J. Steckelberg.

NEVADA

There is no central authority having charge of road work in this state.

NEW HAMPSHIRE

State Highway Department, Concord: State Highway Commissioner, F. E. Everett.

Division Engineers: F. W. Brown, Concord; W. A. Grover, Dover; F. H. Colburn, Concord; H. L. Smith, Lakeport; C. M. Brooks, Keene; C. H. Chandler, Whitefield; O. M. James, Northwood Narrows; C. P. Riford, Concord.

Chief Clerk, C. C. Howe.

NEW JERSEY

Department of Public Roads, Trenton: State Commissioner of Public Roads, Col. Edwin A. Stevens; State Highway Engineer, Robert A. Meeker.

Division Engineers: E. M. Vail, Plainfield; Edward E. Reed, Trenton; Lloyd McEntire, Trenton; Roy Mullins, Collingswood.

Engineer in Charge of Surveys, F. Westervelt Tooker, Newark.

NEW MEXICO

State Highway Commission, Santa Fe: Chairman, Governor Wm. C. McDonald; Secretary, Land Commissioner Robert P. Ervien; Engineer, State Engineer James A. French.

NEW YORK

State Commission of Highways, Albany: State Commissioner of Highways, Edwin Duffy; First Deputy Commissioner, H. Elting Breed; Second Deputy Commissioner, Fred W. Sarr; Third Deputy Commissioner, Benjamin J. Rice.

Secretary, Irving J. Morris.

Auditor, S. D. Gilbert; Assistant Secretary, Frank R. Pennock.

Secretary to the Commissioner, James T. Taaffe.

Supervising Engineer, E. A. Bonney.

Assistant to First Deputy Commissioner, Mark W. Nelson.

Assistant to Second Deputy Commissioner, R. W. Baker.

Assistant to Third Deputy Commissioner, Fred Buck.

Chief Clerk, Harry P. Condon; Claim Agent, John H. Richardson; Engineer of Bridges, Frank A. Hermans; Chief of Bureau of Tests, F. D. Burleigh; Chemist, Joseph E. Myers.

Division Engineers: Division 1—Bertrand H. Wait, Poughkeepsie; Division 2—H. O. Schermerhorn, Albany; Division 3—Theron M. Ripley, Watertown; Division 4—James H. Sturdevant, Utica; Division 5—Howard E. Smith, Binghamton; Division 6—Charles J. McDonough, Syracuse; Division 7—Perry Filkin, Rochester; Division 8—Frederick Steele Strong, Hornell; Division 9—William M. Acheson, Buffalo.

Resident Engineers: Division 1—E. J. Howe, Lowell Grossman and John R. Kalley, Poughkeepsie; Division 2—Chas. T. Fisher, Albany; A. S. Mirick, Plattsburg; Division 3—Thomas J. Schoenlaub, Watertown; Division 4—Roy E. Hall, Utica; Division 5—R. E. Miller, Binghamton; Division 6—R. J. Marcher, Syracuse; Division 7—James E. Kelley, Rochester; Division 8—Richard V. Collins, Hornell; Division 9—Charles M. Edwards, Buffalo; Geo. T. Keith, Olean.

NORTH CAROLINA

State Highway Commission, Raleigh: Chairman, Governor Locke Craig, Raleigh; Secretary, Dr. Joseph Hyde Pratt, Chapel Hill; Benahan Cameron, Stagville; T. F. Hickerson (Professor, University of North Carolina, Chapel Hill); W. C. Riddick (Professor, North Carolina Agricultural and Mechanical College, Raleigh); Guy V. Roberts, Marshall; E. C. Duncan.

State Highway Engineer: W. S. Fallis.

Highway Engineers: D. Tucker Brown, Greensboro; R. E. Snowden, Snowden; R. P. Coble, Sanford; R. T. Brown, Lexington; Wythe M. Peyton, Spruce Pine; J. Roy Pennell, Snow Hill; Ira B. Mullis, Lumberton; S. D. Scott, Goldsboro.

NORTH DAKOTA

State Highway Commission, Bismarck: Governor L. B. Hanna; C. A. Grow, Minot; Secretary, State Engineer Jay W. Bliss.

OHIO

State Highway Department, Columbus: State Highway Commissioner, Clinton Cowen; Deputies: Chief Highway Engineer, H. M. Sharp (Construction); A. H. Hinkle (Maintenance and Repair); J. R. Chamberlin (Bridges).

Chief Clerk, H. L. Hastings.

Secretary, Marmion L. Freeman.

Division Engineers: D. W. Seitz, Harwood Lersch, C. W. Ozias, E. C. Blosser, R. N. Waid, T. T. Richards, W. G. Smith and E. W. Davis.

Engineers: Frank E. Withgott, Arch W. Smith, Glenn R Logue, E. M. Blake, J. R. Burkey, J. W. Graham and O. A. Brand.

Testing Engineer, A. S. Rea.

OKLAHOMA

Department of Highways, Oklahoma City: State Commissioner of Highways, George B. Noble; State Engineer, Max L. Cunningham; Assistant State Engineer, W. P. Danford, Consulting Engineer, James I. Tucker.

OREGON

State Highway Commission, Salem: Governor James Withycombe; Secretary of State Ben W. Olcott; State Treasurer Thomas B. Kay.

Advisory Board: S. Benson, Portland; J. H. Albert, Salem; Leslie Butler, Hood River.

State Engineer, John H. Lewis (Head of Highway Department as per recent decree of Supreme Court of the State of Oregon); Chief Deputy State Engineer, E. I. Cantine; Auditor G. Ed. Ross; Bridge Engineer, Joseph Weare.

Assistant Engineers: W. D. Clarke, Central Point; L. W. Metzger, Salem; W. M. Peters, Glendale; J. H. Scott, Bend; W. E. Eddy, McMinnville; J. A. Elliott, Hood River; T. M. Davis, Siskiyou.

PENNSYLVANIA

State Highway Department, Harrisburg: State Highway Commissioner, Frank B. Black; First Deputy Commissioner (in charge of Bureau of Township Highways), J. W. Hunter; Second Deputy Commissioner, Geo. H. Biles.

Chief Engineer, William D. Uhler.

Bridge Engineer, Willis Whited.

Engineer of Construction, P. M. Tebbs.

Engineer of Tests, Julius Adler.

Chief Clerk, H. W. Fry; Statistician, W. R. D. Hall; Auditor, W. R. Main.

Assistant Engineers: W. A. Van Duzer, Scranton; A. S. Clay, Bloomsburg; H. W. Claybaugh, Franklin; W. F. Cressman, Philadelphia; C. W. Erisman (Acting), York; W. S. Hammaker (Acting), Chambersburg; C. W. Hardt, Harrisburg; S. W. Jackson, Pittsburgh; W. R. Wolfinger, Allentown; C. S. Lemon, Hollidaysburg; W. D. Meyers, Bellefonte; T. C. Frame, Warren; A. B. Gray, Washington; J. S. Ritchey, Wellsboro; F. E. Winter (Acting), DuBois.

Maintenance Engineer, Bureau of Township Highways, W. A. Wynn.

Registrar, Automobile Division, George M. Brusstar.

RHODE ISLAND

State Board of Public Roads, Providence: Chairman, John F. Richmond; Secretary, William C. Peckham; Benjamin F. Robinson; Abram L. Atwood; Frank Cole.

Clerk, Peter J. Lannon.

Chief Engineer, Irving W. Patterson.

SOUTH CAROLINA

Department of Agriculture, Commerce and Industries, Columbia: Commissioner, E. J. Watson; Clerk, H. W. McCreight.

SOUTH DAKOTA

State Highway Commission, Pierre: Chairman, E. C. Issenhuth, Redfield; Secretary, Ben M. Wood, Rapid City; N. O. Monserud, Humboldt.

State Engineer, Homer M. Derr.

TENNESSEE

State Department of Highways, Nashville: Commissioners: Arthur Crownover, Winchester; W. H. Crox, Cleveland; Chas. F. Williams, Paris; Governor Tom C. Rye; Chas. E. Ferris, Dean, Engineering Department, University of Tennessee, Knoxville; Dr. A. H. Purdue, State Geologist.

Secretary, J. J. Murray.

Chief Clerk and Statistician, O. M. West.

State Highway Engineer, A. M. Nelson.

TEXAS

There is no central authority having charge of road work in this state.

UTAH

State Road Commission, Salt Lake City: Chairman, William Spry; Vice Chairman, Richard R. Lyman; Jesse D. Jewkes; William Peterson; W. D. Beers.

State Road Engineer and Secretary, E. R. Morgan.

VERMONT

State Highway Department, Franklin: State Highway Commissioner, Stoddard B. Bates.

County Highway Supervisors: Addison County, W. N. Cady, Middlebury; Bennington County, J. L. Davis, Manchester Center; Caledonia County, M. M. Stocker, Danville; Chittenden County, M. E. Carpenter, Charlotte; Essex County, G. G. Temple, Lunenburg; Franklin County, J. C. Towle, Enosburg Falls; Grand Isle County, State Highway Commissioner Stoddard B. Bates, Franklin; Lamoille County, G. A. Barrows, Morrisville; Orange County, M. C. Flanders, Tunbridge; Orleans County, A. B. Cobleigh, West Derby; Rutland County, C. F. Willis, Rutland; Washington County, R. S. Currier, Barre; Windham County, D. T. Perry, Brattleboro; Windsor County, M. C. Noyes, Sharon.

VIRGINIA

State Highway Commission, Richmond: State Highway Commissioner, George P. Coleman; Wm. M. Thornton (Dean, Engineering Department, University of Virginia); R. B. H. Begg (Professor of Civil Engineering, Virginia Polytechnic Institute); Col. T. A. Jones (Professor of Civil Engineering, Virginia Military Institute).

Assistant State Highway Commissioner, C. B. Scott; Assistant in Charge of Maintenance, C. L. Scott; Assistant in Charge of Office, D. McDonald.

Bridge Engineer, C. D. Snead.

Division Engineers: F. D. Henley, Norfolk; A. H. Pettigrew, Bristol; S. L. von Gemmingen, Lynchburg; C. S. Mullen, State Highway Commission, Richmond; J. L. Cresap (Acting), Waynesboro.

County Engineers: W. F. Anson, Lebanon; B. S. Crawford, Marion; G. A. Martin, Tazewell; M. L. Appleton, Houston; V. von Gemmingen, Kenbridge; C. S. Schenck, Stephens City; F. H. Murray, Norfolk; Garrett W. Scott, Norton.

Resident Engineers and Superintendents: B. R. Cowherd, Jr., Norfolk; S. C. Liggett, Gordonsville; W. I. Lee, Harrisonburg; E. T. Howard, Bristol; G. C. Appleton, State Highway Commission, Richmond; B. A. Marshall, Lynchburg; W. M. Austin, Danville; S. J. Sadler, Lawrenceville; E. F. LaPrade, Tappahannock; J. T. Wright, East Falls Church; E. V. St. Martin, Gate City; A. P. Eskridge, Pedlar Mills; Z. G. Durfey, Tappahannock.

WASHINGTON

State Highway Board, Olympia: Chairman, Governor Ernest Lister; Secretary, State Highway Commissioner James Allen; Ex-Officio, State Treasurer Edward Meath; Ex-Officio, State Auditor C. W. Clausen; Ex-Officio, Chas. A. Reynolds, Chairman, Public Service Commission.

State Highway Department: State Highway Commissioner, James Allen; Assistant State Highway Commissioner, H. G. Porak; Chief Engineer, George F. Cotterill; Road Maintenance Engineer, W. L. Goodwin; Right of Way Agent, Chas. L. Dufault.

Assistant Engineers: H. W. Boetzkes, W. L. Bowen, H. J. Doolittle, R. M. Gillis, Chas. Jordan, F. H. Richardson, Chas. I. Signer.

WEST VIRGINIA

State Road Bureau, Morgantown; Chief Road Engineer, A. Dennis Williams; Dean of the College of Agriculture and Director of Experiment Station, John Lee Coulter; A. H. Gray; J. William Lynch.

Bridge Engineer, Dr. Roland P. Davis; Assistant Bridge Engineer, Lawrence Lee Jemison.

Chief Chemist, Bert H. Hite; Joseph Bierer (in charge of physical laboratory).

Statistician, Robert Duncan.

Editor, Robert A. Kramer.

WISCONSIN

State Highway Commission, Madison: Commissioners: John A. Hazelwood, Chairman; W. O. Hotchkiss, Secretary; F. E. Turneaure; John S. Owen; J. H. Van Doren.

State Highway Engineer, A. R. Hirst.

Bridge Engineer, M. W. Torkelson; Engineer of Surveys, Gordon F. Daggett; Chief Inspector, J. T. Donaghey; Chief Clerk, William Dawson.

Division Engineers: F. M. Balsley, Madison; J. E. Gillespie, Milwaukee; W. M. Conway, Green Bay; F. F. Mengel, Grand Rapids; W. C. Buetow, La Crosse; S. P. Hall, Eau Claire; F. M. Sergeant, Ashland.

Assistant Engineers: Thos. E. Reilly and B. E. Dodge, Madison; A. L. Luedke, Milwaukee; G. H. Nickell, Green Bay; A. E. Kringel, Grand Rapids; T. M. Reynolds, La Crosse; H. W. Vroman, Eau Claire; F. W. Labram, Ashland.

WYOMING

There is no central authority having charge of road work in the state.

State Engineer, James B. True, Cheyenne; Deputy State Engineer, Albert B. Bartlett; Assistant State Engineer, C. D Shawver.

Frank B. Black Appointed State Highway Commissioner of Pennsylvania

Frank B. Black, of Meyersdale, has been appointed State Highway Commissioner of Pennsylvania, as was noted in the issue of July 8. Commissioner Black succeeds the late Robert J. Cunningham, who died at his home in Sewickley on April 26, after serving in the State Highway Department for about a year.

Commissioner Black was born at Somerfield, Somerset County, Pa., April 17, 1864, and has lived in that county until the present. His father, George J. Black, was a pottery manufacturer, merchant and farmer. In 1873 the family moved to Meyersdale, where Commissioner Black received his education. When eighteen years old he purchased his father's pottery business, later branching out into the manufacture of drain tile and brick. He carried on that business for fifteen years, then became interested in coal mining. Since that time he has opened and operated many coal mines, selling the properties when developed. For a number of years he and several associates operated coal mines and sold their product through a New York selling agency operating under the firm name of the Black, Field & Emmons Co. In 1907 he organized the Atlantic Coal Co., which has mines at Boswell and Blackfield.

FRANK B. BLACK.
State Highway Commissioner of Pennsylvania.

In June, 1910, Governor Brumbaugh appointed Commissioner Black a member of the State Board of Agriculture.

Commissioner Black took the oath of office as State Highway Commissioner on July 5 and immediately assumed control of the department. His first official act was the issuing of a statement to the effect that he would carry out, as far as possible, the policies of his predecessor.

Dixie Highway Association Tour

A tour over a part of the eastern division of the Dixie Highway is being planned for October. The arrangements are in the hands of a special committee composed of Carl G. Fisher, Chairman, Col. H. B. Hanger and A. F. Sanford.

According to an official announcement, the tour will leave Cincinnati on Monday, Oct. 16, and end at Jacksonville, Fla., Sunday, Oct. 22. The tentative schedule is as follows: Monday, Cincinnati, Ohio, to Berea, Ky.; Tuesday, Berea to Pineville, Ky.; Wednesday, Pineville to Knoxville, Tenn.; Thursday, Knoxville to Chattanooga, Tenn.; Friday, Chattanooga to Atlanta, Ga.; Saturday, Atlanta to Waycross, Ga.; Sunday, Waycross to Jacksonville, Fla.

Apportionment of Federal Aid Road Funds

In accordance with the federal aid law recently passed, the Secretary of Agriculture has apportioned to the various states the federal aid funds for the fiscal year ending June 30, 1917. The appropriation for that year amounts to $5,000,000 which, after the deduction of 3 per cent. for administration, leaves $4,850,000 to be apportioned in accordance with the terms of the law, one-third according to area, one-third according to population, and one-third according to the mileage of rural delivery routes and star routes. The allotments to each state are shown in the following table:

Alabama	$104,148.90	Nebraska	$106,770.81
Arizona	68,513.52	Nevada	64,398.30
Arkansas	82,689.10	New Hampshire	20,996.62
California	151,063.92	New Jersey	59,212.68
Colorado	83,690.14	New Mexico	78,737.81
Connecticut	31,090.44	New York	250,720.27
Delaware	8,184.37	North Carolina	114,381.92
Florida	55,976.27	North Dakota	76,143.06
Georgia	134,329.48	Ohio	186,905 42
Idaho	60,463.50	Oklahoma	115,139.00
Illinois	220,926.23	Oregon	78,687.37
Indiana	135,747.62	Pennsylvania	230,644.17
Iowa	146,175.60	Rhode Island	11,665.71
Kansas	143,207.40	South Carolina	71,807.64
Kentucky	97,471.91	South Dakota	80,946.02
Louisiana	67,474.66	Tennessee	114,153.48
Maine	48,451.50	Texas	291,927.81
Maryland	44,047.22	Utah	56,950.15
Massachusetts	73,850.95	Vermont	22,844.47
Michigan	145,783.72	Virginia	99,660.71
Minnesota	142,394.06	Washington	71,884.28
Mississippi	88,905.84	West Virginia	53,270.46
Missouri	169,720.41	Wisconsin	128,361.07
Montana	98,287.19	Wyoming	61,196.82

This apportionment does not include the $1,000,000 appropriation each year for ten years for the development of roads in the national forests.

Reinforced Concrete Bridge Test by the Minnesota State Highway Commission

The State Highway Commission of Minnesota is now building at the State Fair Grounds a concrete bridge which is to be tested to destruction at the State Fair in September.

The purpose is to give county and township highway officials an opportunity to see the action of a concrete bridge under a breaking load. Tests will be conducted during the entire week of the fair and results posted on a bulletin board. The cooperation of the experimental laboratory of the University of Minnesota has been secured, and it is expected that very valuable results will be obtained. Very careful measurements will be made with various loadings during the week and on the last day the bridge will be tested to destruction.

It is stated that the design of the superstructure of the bridge which is of an improved type for short spans calls for about 35 per cent. less concrete than is used in the ordinary slab bridge.

The Louisiana Legislature has postponed for two years a vote on a proposed bond issue of $15,000,000 for the construction of roads.

The Improvement of Roads Leading to the Cincinnati Speedway is to be undertaken as a part of the plans for the race to be held there on Labor Day, according to a recent announcement by the Cincinnati Speedway Co. It is stated that Speedway officials have been in consultation with the Hamilton County Board of Commissioners and that as a result plans are being made for the improvement of the three highways leading directly to the track. These are the Springdale Track, the Reading Road and the Montgomery Pike.

COMING MEETINGS

August 16-18—League of Wisconsin Municipalities—Annual meeting, Oshkosh, Wis. Secretary, Ford H. McGregor, Madison, Wis.

August 17-19—Texas Good Roads Association—Annual meeting, Modina Lake, San Antonio, Tex. Secretary, D. E. Colp, San Antonio, Tex.

August 21-23—Union of Canadian Municipalities—Sixteenth annual convention, Montreal, P. Q. Secretary-Treasurer, W. D. Lighthall, K. C., Montreal, P. Q.

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Union of Canadian Municipalities

At the sixteenth annual convention of the Union of Canadian Municipalities which, as noted above, will be held at Montreal, P. Q., on August 21, 22 and 23, there will be presented several papers of interest to highway engineers.

The forenoon and afternoon of the first day of the convention will be devoted to the formal opening and to reports from various officers and affiliated organizations. The presentation of papers will commence at the evening session on August 21, and will be continued at the forenoon, afternoon and evening sessions on August 22. The last day of the convention will be devoted to the election of officers for the coming year and to the completion of unfinished business. Two papers are also scheduled for that session.

Among the papers of special interest to road builders are the following: "The Town Planning Outlook," by Thomas Adams, Town Planning Advisor, Commissioner of Conservation, Ottawa, Ont.; "Good Roads Movement and Its Influence on Urban Municipalities," by J. Duchastel, President, Good Roads Association of Canada; "A Study of a City's Sinking Fund," by Thomas Bradshaw, Commissioner of Finance and City Treasurer, Ottawa, Ont.; "Municipal Finance," by Sir Frederick Williams-Taylor, General Manager, Bank of Montreal, P. Q.; "Municipal Accounting," by E. T. Sampson, Secretary-Treasurer, City of Outremont, P. Q.; "How Best to Introduce Modern Systems of Municipal Work," by Horace L. Brittain, Managing Director, Bureau of Municipal Research, Toronto, Ont.; "Municipal Assessment," by Robert Ryan, Chairman, Finance Committee, City of Three Rivers, P. Q.

PERSONAL NOTES

Adam Saal, a contractor in Central Illinois, died recently at Peoria, Ill.

F. A. Torkelson has been appointed City Engineer of Green Bay, Wis.

Frank Minkler, Street Commissioner of Carthage, Mo., has resigned to take a position with the Carthage special road district.

J. E. Johnson has been appointed County Highway Engineer of Osceola County, Fla., with headquarters at Kissimmee.

John Willaims, who has been a junior assistant engineer of the New York Public Service Commission, has resigned to take a position with the New York State Highway Department. He has been stationed at Canaseraga, N. Y.

NEWS NOTES

Five Counties of Arkansas, Crawford, Lafayette, Pike, Saline and Sevier, will build 50 miles of roads at a cost exceeding $150,000, during the next few months.

Street work in the Borough of Richmond, New York City, to be done during the current year includes the following: 48,800 sq. yds. of bituminous concrete paving at a cost of $108,600; 2,200 sq. yds. of brick paving at a cost of $4,500; 12,600 sq. yds. of concrete paving at a cost of $26,500, and 10,880 sq. yds. of stone block paving at a cost of $49,600. These costs include the foundations and the grading work.

A Contract for a Large Concrete Arch Highway Bridge has Recently been Awarded in Philadelphia, Pa. The bridge will carry Bensalem Ave. over Pennypack Creek and the Pennypack Park drives. The bridge proper will consist of a central arch span of 100 ft. connecting at each end with a 60-ft. span. At the end of the 60-ft. spans heavy pylons will separate the bridge proper from the approaches. The bridge will carry a 54-ft. roadway and will have a clear width between the rails of 78 ft. The contract was awarded to Day & Zimmerman of Philadelphia, and will be under the direction of George E. Datesman, Director of the Department of Public Works, and Chester E. Albright, Chief Engineer of the Bureau of Surveys. The work will be under the direct charge of Jonathan Jones, Assistant Engineer of the Bridge Division.

The Extension of the System of Tar Spraying on the Roads of Great Britain was recommended in the presidential address of J. S. Brodie, Borough Engineer of Blackpool, England, at the forty-third annual general meeting of the Institution of Municipal and County Engineers held at Blackpool, June 29 to July 1 of this year. In that portion of his address devoted to highways, President Brodie pointed out the importance of the improvement and economical maintenance of the highways of the kingdom. He also directed attention to the reduced amounts available for such work from the funds of the Road Board, stating that "there is no more difficult sphere in municipal expenditure in which reduced expenditure can be safely attempted than in that of road maintenance." He pointed out that the present traffic on the roads is greater than it was before the outbreak of the war, and that, therefore, any attempt to greatly reduce the cost of maintenance would result in a greatly increased cost in the near future. In support of his recommendation for the extension of tar spraying, he said he believed that for the same expenditure a tar-sprayed road would last twice as long as water bound macadam. He also referred to the subject of mechanical haulage and heavy traffic on the highways, saying that the latter had been referred by the Local Government Board to a special committee. These matters are of the greatest moment, according to President Brodie, and "it is to be hoped that the committee will adopt no narrow views, nor recommend vexatious or prohibitive restrictions on heavy traffic, but that, as road engineers, we shall rise to the occasion, and provide adequate roads for the heaviest traffic, within reasonable limits, that is likely to be put upon them."

LETTER TO THE EDITOR

The Roads of Lake County, Florida

Editor, "Good Roads":

My wife and I recently made a business trip through Lake County which allowed us to enjoy about 150 miles of good roads lately completed in the county.

It was hard to believe that we were in Lake County, considering the previous condition of the old sand trails. It was like traveling through an immense park of long straight stretches, level in many places, hilly in others, then winding in beautiful curves through shady hammocks with great live oaks, cypress and gum trees hung with moss and vines, through pine forests and over beautiful rolling lands, through fields of waving Natal grass of ever changing color, through orange groves with fruit and bloom, through fields of corn and vegetables, around beautiful lakes with sandy shores and over bridges spanning small rivers. One can clip it off at 40 miles an hour from the Clermont section to any point on the county line and then connect with other good roads and go on and on. Our new roads have cost $500,000 and have just been opened. The contractors who built them understood their business and all roads here are under the supervision of the county commissioners.

The district commissioner should make it his special business to see that the roads are preserved in proper condition and to keep all ditches open, the shoulders graded and road surfaces dragged. There is nothing like a well-dragged surface and shallow ditches and shoulders kept in good shape. This means long service and good roads, especially down here.

J. H. Compton, our present district county commissioner, should be complimented on his untiring supervision of the roads in this district, and we hope the next commissioner, J. M. Lowry, will take the same interest.

This section will soon have a grand scenic drive all the way around Lake Minnehaha, which will attract the many tourists motoring through the state. One bridge 900 ft. long is completed on the north side of the lake and all the piling for the other, on the south side, is in position and erection is progressing. I notice that a little attention is given to ditches in this district and in others. Ditches are important, and shoulders in good shape prevent the little rivulets in sand-clay roads.

R. D. Millholland.

South Clermont, Fla.

BOOK NOTICE

HIGHWAY ENGINEERS' HANDBOOK by Wilson G. Harger, C. E., Assoc. M. Am. Soc. C. E., First Assistant Engineer, New York State Department of Highways, and Edmund A. Bonney, Supervising Engineer, New York State Department of Highways. Second edition. Flexible leather, 4 x 7 ins., 609 pp.; illustrated. McGraw-Hill Book Co., Inc., 239 West 39th St., New York, N. Y. $3.00.

In general arrangement and method of treating the subject, this second edition of the "Highway Engineers' Handbook" follows the first edition published in 1912. The changes made are principally in the revision of the portions on top courses to bring the text up to date, and in the addition of considerable data on tests, design, cost data, specifications, etc. In all, about 100 pages of new material have been added. The book is divided into two parts, the first dealing with the principles of design and the second with the practice of design and construction. Chapter headings are as follows: Part I, Chapter I—Grades and Alignment; Chapter II—Sections; Chapter III—Drainage; Chapter IV—Foundations for Broken Stone Roads; Chapter V—Top Courses and Their Maintenance; Chapter VI—Minor Points; Chapter VII—Materials. Part II, Chapter VIII—The Survey; Chapter IX—Office Practice; Chapter X—Cost Data and Estimates; Chapter XI—Notes on Construction; Chapter XII—Specifications.

REPORT

NEW YORK CITY, DEPARTMENT OF STREET CLEANING. Report on Examination of Personnel, Methods of Work and Equipment, with Special Reference to the Installation of a Model District in the Borough of Manhattan, made to Commissioner John T. Fetherston of the Department, by Richard T. Fox. Dated December, 1915. Paper, 6x9 ins., 48 pp.; illustrated, inset charts.

This report contains, first, recommendations concerning the organization and conduct of the department as a whole, and second, recommendations referring especially to the installation of a model district. Included in the remainder of the report are discussions of the present work of the department and of the general matter of street cleaning in New York City, a historical sketch of the New York City Department, and other matter. The illustrations show equipment for various kinds of cleaning, the condition of a street after removing the heavier material, and piles of material removed from different parts of a typical street, showing its distribution over the surface. The report was made public on August 1.

NEW PUBLICATIONS

STRENGTH AND OTHER PROPERTIES OF CONCRETE AS AFFECTED BY MATERIALS AND METHODS OF PREPARATION, by R. J. Wig, Engineer Physicist, G. W. Williams, Assistant Engineer Physicist, and E. R. Gates, Assistant Physicist, of the Bureau of Standards, United States Department of Commerce; Technologic Paper of the Bureau of Standards, No. 58. Paper, 7x10 ins., 172 pp.; illustrated.

This publication is an exhaustive report of the investigations made by the authors on the strength and other properties of concretes as prepared with different materials and by different methods. The text is illustrated by many diagrams and charts, and includes a large mass of tabular data on the results of tests.

GEORGIA GEOLOGICAL SURVEY; A REPORT ON THE LIMESTONES AND MARLS OF THE COASTAL PLAIN OF GEORGIA, by J. E. Brantly, Assistant State Geologist; Bulletin No. 21 of the Geological Survey of Georgia. Cloth, 7x10 ins., 300 pp.; illustrated, inset geologic map.

Part I of this publication comprises an exhaustive treatise of the physiography and geology of the Coastal Plain of Georgia; Part II is a description of the calcareous deposits in the coastal plain, and Part III is a discussion of the uses and preparation of limestone. Included in the latter is a description of a model crushing plant for preparing limestone for road metal. The report is profusely illustrated by half-tone reproductions of photographs showing geological formations in various parts of the area covered by the report.

AMERICAN ROAD BUILDERS' ASSOCIATION. Proceedings of the Thirteenth Annual Convention held at Pittsburgh, Pa., February 28 to March 3 (inclusive), 1916, together with the reports of the Executive Committee, Secretary, and Treasurer presented at the Annual Meeting, February 4, 1916; list of members, etc. Paper, 6x9 ins., 264 pp.; frontispiece. Published by the Association, 150 Nassau St., New York, N. Y. Price (to non-members) $2.00.

This publication follows the general lines of the previous proceedings issued by the American Road Builders' Association. It includes the addresses and papers delivered at the Pittsburgh Convention, verbatim reports of the discussions upon the papers, and accounts of entertainment features of the congress. There is also included a list of the officers and directors for 1915, a list of the exhibitors at the Seventh National Good Roads Show held in conjunction with the convention, a report of the annual Association meeting held at New York, N. Y., on February 4, 1916, the annual report of the executive committee, the annual report of the secretary, and the annual report of the treasurer. These are followed by the constitution and by-laws of the organization, a list of the 1916 officers, directors and committees, and a list of members. A half-tone reproduction of a photograph of the delegates in front of the convention hall is printed as a frontispiece. The contents are indexed. The book is printed on paper of good quality and bound in gray paper covers printed in blue.

EQUIPMENT — TRADE — MATERIALS

New Adjustable Rectangular Culvert Form

An adjustable steel form for the construction of concrete culverts of rectangular cross section is shown in the accompanying illustration. The form has been put on the market during the present year by the Blaw Steel Construction Co., manufacturer of the Blaw forms for sidewalk, curb and road work.

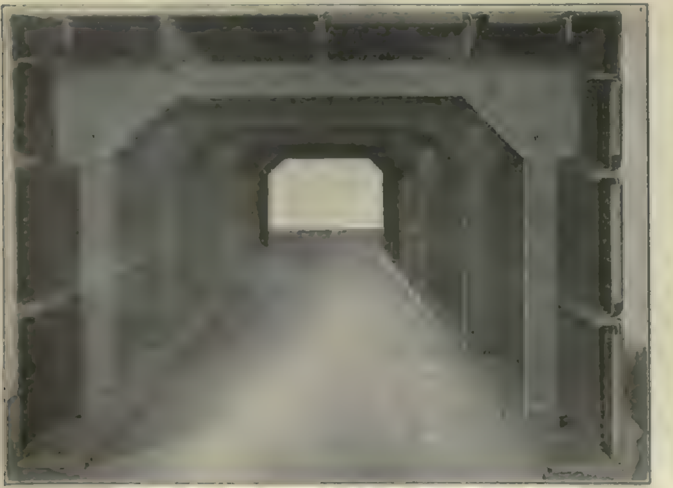
The form consists of steel sections and interior braces, all bolted together, as shown in the illustration. Each leg of the corner sections is 12 ins. long, while the other sections are the regular 12-in. rails used in the sidewalk, curb and road forms. The roof and side panels are fastened to the interior supporting angles by hook bolts passing through the flanges of the panels. These bolts are permanent parts of the supporting angles and serve to draw the entire form together.

The sections are furnished in 5 and 10-ft. lengths and are fastened together longitudinally by means of the Blaw slip joint connection used in the other forms manufactured by the company. This connection is positive in action and is operated by hand without the use of tools.

In constructing a culvert with this form the concrete for the base and floor is first placed; boards 1x4 ins. are then laid along the sides of the base and the form placed in position on top of these. After the concrete is set the boards are withdrawn, the hook bolts released, the roof of the form removed in one section and each side piece removed.

The form is furnished in five standard sets in lengths of 20, 25, 30, 35 and 40 ft. Each set is adjustable to any of the following heights: 24 ins., 36 ins., 48 ins., 60 ins. For each of these heights any of the following widths may be obtained: 36 ins., 48 ins., 60 ins., 72 ins.

The advantages claimed for the form are low first cost, extreme durability, economy in operation, low transportation cost, simplicity of design, smooth finish of the concrete, and the adjustability of the form.



BLAW ADJUSTABLE CULVERT FORM.

The general offices of the Blaw Steel Construction Co., manufacturer of the form, are at Pittsburgh, Pa.

TRADE NOTES

The Asbestos Protected Metal Co., Pittsburgh, Pa., has appointed Melbert W. Taber manager of its office at Detroit, Mich. Mr. Taber was formerly Manager of Maintenance and Construction of the Packard Motor Car Co.

The Harold L. Bond Co., Boston, Mass., has received a letter from the City Clerk of Skagway, Alaska, stating that a 3½x3½-in. Atlantic diaphragm pumping engine, purchased three years ago by the city, has given unfailing satisfaction, although operated continuously in sand and gravel.

The Studebaker Municipal Utilities Co., South Bend, Ind., has been organized to take over the Ottofy patent on street flushers, formerly owned by the Sanitary Street Flushing Machine Co. Flushers manufactured under this and other patents will hereafter be marketed through the Vehicle Division of the Studebaker organization.

NEWS NOTES

The Oregon State Highway Department has approved the construction of a 16-mile road from White Salmon to Snowden. The road will be known as Permanent Highway No. 6 and will provide direct connection with Yakima Valley points when the proposed Yakima-Columbia Highway is constructed.

Ninety Per Cent. of the Automobile Registration and License Fees Paid in 1915 was Used for Road Work, according to a recent statement by the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture. The total number of motor vehicles registered was 2,445,664, it is stated, and the total paid for registrations and for drivers' and dealers licenses was $18,245,713. Of this total payment, $16,213,387 was used for the construction and maintenance of roads. It is also stated that automobile fees now amount to nearly 7 per cent. of the total sum spent on rural road and bridge building, while in 1906 the total income from this source was less than three-tenths of 1 per cent. of the total expenditure. In 42 of the states, according to the Office of Public Roads, all, or the major portion, of the revenues from motor vehicle registrations and licenses is expended for road work or for the maintenance of the state highway department; in 20 states, all, or the major portion, of the net motor vehicle revenues are expended by or under the direction of the state highway department, and in 7 states, from one-half to one-fourth of the state motor vehicle revenues are expended through the state highway department, the remainder being disbursed by the local authorities. In many states, revenues from fines and penalties, as well as registration and license fees, are applied to road work.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. L.
New Series, Vol. XII.

NEW YORK, AUGUST 12, 1916

Number 7

Details of the Apportionment of Federal Aid Road Funds

A table showing the amount allotted to each state from the federal road fund for the year ending June 30, 1917, was printed in a recent issue of "Good Roads." Since its publication a table showing the data on which the apportionment was made has been secured. The table, which is self-explanatory, is printed herewith.

DETAILS OF FEDERAL AID APPORTIONMENT

State.	Area as of 1910 United States census.		Population as of 1910 United States census.		Star and rural routes shown by centificate of Postmaster General as of June 30, 1916.		Percentage apportionment.	Sum apportioned.
	Square miles.	Percentage.	Population	Percentage.	Miles.	Percentage.		
Alabama	51,998	1.71796	2,138,093	2.33311	29,615	2.39111	2.14740	$104,148.90
Arizona	113,956	3.76500	204,354	.22299	3,096	.24997	1.41265	68,513.52
Arkansas	53,335	1.76214	1,574,449	1.71806	20,245	1.63458	1.70493	82,689.10
California	158,297	5.22999	2,377,549	2.59441	18,823	1.51976	3.11472	151,063.92
Colorado	103,948	3.43435	799,024	.87191	10,781	.87045	1.72557	83,690.14
Connecticut	4,965	.16404	1,114,756	1.21644	6,721	.54265	.64104	31,090.44
Delaware	2,370	.07830	202,322	.22078	2,566	.20718	.16875	8,184.37
Florida	58,666	1.93827	752,619	.82127	8,706	.70292	1.15415	55,976.27
Georgia	59,265	1.95806	2,609,121	2.84711	43,397	3.50386	2.76968	134,329.48
Idaho	83,888	2.77158	325,594	.35529	7,594	.61314	1.24667	60,463.50
Illinois	56,665	1.84216	5,638,591	6.15290	69,860	5.64048	4.55518	220,926.23
Indiana	36,354	1.20110	2,700,876	2.94723	52,619	4.24844	2.79892	135,747.62
Iowa	56,147	1.85505	2,224,771	2.42770	58,943	4.75904	3.01393	146,175.60
Kansas	82,158	2.71442	1,690,949	1.84418	53,240	4.29858	2.95273	143,207.40
Kentucky	40,598	1.34132	2,289,905	2.49877	27,113	2.18910	2.00973	97,471.91
Louisiana	48,506	1.60259	1,656,388	1.80747	9,458	.76364	1.39123	67,474.66
Maine	33,040	1.09161	742,371	.81008	13,566	1.09531	.99900	48,451.50
Maryland	12,327	.40727	1,295,346	1.41350	11,194	.90380	.90819	44,047.22
Massachusetts	8,266	.27310	3,366,416	3.67347	7,698	.62153	1.52270	73,850.95
Michigan	57,980	1.91561	2,810,173	3.06650	49,981	4.03545	3.00585	145,783.72
Minnesota	84,682	2.79782	2,075,708	2.26504	46,384	3.74503	2.93596	142,394.06
Mississippi	46,865	1.54838	1,797,114	1.96103	24,646	1.98991	1.83311	88,905.84
Missouri	69,420	2.29357	3,293,335	3.59373	57,108	4.61088	3.49939	169,720.41
Montana	146,997	4.85664	376,053	.41035	10,065	.81264	2.02654	98,287.19
Nebraska	77,520	2.56119	1,192,214	1.30096	33,964	2.74224	2.20146	106,770.81
Nevada	110,690	3.65710	81,875	.08934	2,935	.23697	1.32780	64,398.30
New Hampshire	9,341	.30862	430,572	.46985	6.444	.52029	.43292	20,996.62
New Jersey	8,224	.27171	2,537,167	2.76859	7,708	.62234	1.22088	59.212.68
New Mexico	122,634	4.05171	327,301	.35715	5,716	.46151	1.62346	78,737.81
New York	49,204	1.62565	9,113,614	9.94489	48,773	3.93792	5.16949	250,720.27
North Carolina	52,426	1.73211	2,206,287	2.40753	36,358	2.93553	2.35839	114,381.92
North Dakota	70,837	2.34039	577,056	.62969	21,548	1.73978	1.56996	76,143.06
Ohio	41,040	1.35592	4,767,121	5.20194	61,968	5.00328	3.85372	186,905.42
Oklahoma	70,057	2.31462	1,657,155	1.80831	37,145	2.99908	2.37400	115,139.00
Oregon	96,699	8.19485	672,765	.73413	11,621	.93828	1.62242	78,687.37
Pennsylvania	45,126	1.49092	7,665,111	8.36426	54,638	4.41146	4.75555	230.644.17
Rhode Island	1,248	.04123	542,610	.59210	1,093	.08825	.24053	11,665.71
South Carolina	30,989	1.02385	1,515,400	1.65362	21,851	1.76424	1.48057	71,807.64
South Dakota	77,615	2.56433	583,888	.63715	22,362	1.80550	1.66899	80,946.02
Tennessee	42,022	1.38837	2,184,789	2.38407	40,731	3.28861	2.35368	114,153.48
Texas	265,896	8.78496	3,896,542	4.25195	62,181	5.02048	6.01913	291,927.81
Utah	84,990	2.80799	373,351	.40740	3,806	.30730	1.17423	56,950.15
Vermont	9,564	.31599	355,956	.38842	8,777	.70865	.47102	22,844.47
Virginia	42,627	1.40836	2,061,612	2.24966	31,045	2.50656	2.05486	99,660.71
Washington	69,127	2.28389	1,141,990	1.24615	11,350	.91640	1.48215	71,884.28
West Virginia	24,170	.79855	1,221,119	1.33250	14,417	1.16402	1.09836	53,270.46
Wisconsin	56,066	1.85237	2,333,860	2.54674	43,854	3.54076	2.64662	128,361.07
Wyoming	97,914	3.23499	145,965	.15928	4,844	.39110	1.26179	61,196.82
Total	3,026,719	100.00000	91,641,197	100.00000	1,238,548	100.00000	100.00000	$4,850,000.00

Road Contracts Awarded in Pennsylvania

Two road contracts involving a total of about $121,000 have been awarded by State Highway Commissioner F. B. Black of Pennsylvania. Both contracts were awarded on bids received at the letting of July 19.

The larger of the two contracts is for the construction of Section 8 of State Highway Route 131 in Penn, Upper Oxford and Lower Oxford Townships, Chester County. The section which is 32,114 ft. in length will be paved with concrete. The contract was awarded to the low bidder, the Souder Construction Company of Lancaster, Pa., at $109,631.81.

The second contract was awarded for the construction of roads covered by State Aid Application No. 320, in Hickory Township, Forest County. The road is 5,385 ft. in length, and will be paved with water bound macadam. The contract was awarded to the South Shore Construction Co., of Erie, Pa., at $11,527.64.

New York Convicts to Build Adirondack Roads

Thirty convicts from the state prison at Auburn, N. Y., left last week to establish a road camp at Shurtliff in the Adirondacks. The men traveled under two guards.

The camp is to be operated by the State Prison Department and the State Highway Department, the food and clothing being supplied from Auburn. The camp is further from the prison, it is reported, than any which has been operated in the past.

Good Roads Days in Alabama

In accordance with the law of the state, August 14 and 15, Monday and Tuesday of next week, will be observed as Good Roads Days in Alabama.

At the 1915 session of the Alabama Legislature a law was passed establishing August 14 and 15 of each year as Good Roads Days. The law enjoins upon public officials, educational and public institutions and the citizens of the state the observance of these days, and directs the Governor to issue a proclamation, sixty days in advance, calling upon public officials to urge the citizens within their jurisdictions to work on the roads on the days designated. The law was passed at the instigation of the Alabama Good Roads Association.

Contracts for Highway Improvement to be Awarded in Ohio

Bids for the improvement of 30 sections of road in various counties in Ohio are to be received by State Highway Commissioner Clinton Cowen at the office of the State Highway Commission, Columbus, Ohio, on Thursday, August 17. The work, for which plans and specifications are on file at the State Highway Department and at the offices of the various county highway superintendents, is shown in the accompanying table.

ROAD CONTRACTS TO BE AWARDED IN OHIO

County	Name of Road	Length of Pavement—Feet	Width of Pavement—Feet	Kind of Road	Estimated Cost of Construction
Adams	Sec. C, West Union-Sinking Springs	14,880	14	Water bound macadam	$19,052.71
Allen	Sec. A, Lima-Kenton	10,589	18	Brick*	55,884.79
Athens	Sec. J, Logan-Athens	1,950	16	Brick	5,952.16
Auglaize	Sec. b-1, Kenton-Wapakoneta	3,308	20, 23, 28, 35	Brick, Concrete and W. B. Mac.	22,878.24
Cuyahoga	Sec. "b", Cleveland-Massillon	3,000	16	Brick	14,014.65
Gallia	Sec. G, Ohio River	4,000	14	Water bound macadam	7,221.41
Gallia	Sec E, Jackson-Gallipolis	5,550	14	Water bound macadam	11,038.87
Geauga	Sec. H, Cleveland-Meadville	29,762	10	Concrete and brick	74,212.46
Harrison	Sec. D, Dennison-Cadiz	10,554	14	Water bound macadam	19,465.65
Henry	Sec. A, Toledo-Napoleon	17,700	16	Water bound macadam	41,937.18
Lawrence	Sec. J, Ohio River	5,575	16	Bituminous Macadam Reinforced concrete	14,517.30 16,892.80
Lawrence	Sec. I, Ohio River	11,540	16, 18, 20	Bituminous macadam Brick Concrete	19,345.35 31,260.55 30,334.35
Lawrence	Sec. D, Ironton-Miller	5,280	16	Bituminous macadam	12,033.35
Logan	Sec. d, Bellefontaine-Richwood	1,774	14 and 18	Concrete	6,337.08
Mahoning	Sec. O, Youngstown-Akron	9,077	16	Brick	25,686.04
Mahoning	Sec. A, Youngstown-Lowellville	10,604	16	Brick	36,217.49
Mercer	Sec. b, Celina-Wabash	2,653	16	Concrete	7,399.75
Monroe	Sec. E, Woodsfield-Barnesville	17,400	—	Graded	17,126.94
Perry	Sec. P, Newark-New Lexington	10,030	16	Water bound macadam	24,179.52
Pickaway	Sec. L, Cincinnati-Zanesville	13,900	16	Bituminous macadam Water bound macadam	20,240.75 14,302.19
Preble	Sec. F, Dayton-Indianapolis	23,473	16	Bituminous macadam	38,426.54
Putnam	Sec. A, Findlay-Delphos	7,767	16	Water bound macadam	7,301.36
Putnam	Sec. F, Ottawa-Findlay	11,350	16	Water bound macadam	13,077.72
Putnam	Sec. B, Findlay-Delphos	2,000	16 and 20	Reinforced concrete	6,939.66
Ross	Sec. O, Portsmouth-Columbus	3,000	16	Brick	9,684.25
Ross	Sec. A, Dayton-Chillicothe	4,100	16	Water bound macadam	7,961.30
Sandusky	Sec. J, Lima-Sandusky	11,412	16	Water bound macadam	24,955.15
Scioto	Sec. L, Ohio River	5,100	16	Brick	22,332.95
Vinton	Sec. A, McArthur-Gallipolis	9,375	10	Brick Water bound macadam Concrete	19,432.28 16,525.55 17,443.80
Warren	Sec. A, Dayton-Lebanon	13,084	14	Water bound macadam	4,998.20

*Alternate bids will be received for asphaltic concrete; estimated cost, $51,271.93.

Practically all of the work listed above includes besides the construction of the pavement the building of bridges and culverts, grading, and incidental work.

Bids will also be received for the construction of two bridges, one a 30-ft. concrete arch bridge in Hocking County to cost $2,525.95, and the other a wooden bridge in Vinton County, to cost $1,962.

Large Contract Awarded in Monroe County, Michigan

The Road Commissioners of Monroe County, Mich., have recently awarded a contract for the construction of a concrete road on the old Military Road between Monroe and Rockwood.

The road which is 13.57 miles long is a link in the road system between Detroit, Mich., and Toledo, Ohio, and also in the Great Lakes branch of the Dixie Highway. Bids were received from five firms, the lowest of which, the Central States Construction Co. of Columbus, Ohio, was awarded the contract for about $199,000. One-half of the road will be completed in 1916 and the remainder in 1917.

Plan to Build Truck Roads Through Central Park, New York City

In order to lessen heavy truck traffic on upper Fifth Avenue and to reduce the cost of hauling between the east and west sides in the Central Park section of New York, N. Y., plans have been prepared looking toward the widening of 65th, 79th and 97th Streets where they run through the park.

These roadways are 25 ft. wide, with 5-ft. sidewalks on each side and were built before motor trucks were thought of. It is planned to do away with one sidewalk and add the 5-ft. strip thus obtained to the roadway. At present it is necessary for heavy truck traffic to go north to 110th St., or south to 59th St., in order to get from one side of the city to the other.

A traffic count taken recently on Fifth Avenue showed that in 24 hours 8,299 vehicles passed 66th St., southbound, and 8,153 northbound. Details of the traffic count are reported as follows:

"The maximum number southbound in one hour was 654, northbound 659. The northbound peak of traffic is between 5 and 6 p. m.; southbound between 2 and 3 p. m. About 65 per cent. of this traffic consists of passenger vehicles, omnibuses included. The 35 per cent. of commercial vehicles is equally divided between light and heavy. Sixty per cent. of the light vehicles are horse-drawn and 65 per cent. of the heavy vehicles are motor-driven. The passenger vehicle traffic is greatest between 6 and 7 p. m. The motor truck traffic is heaviest between 8 and 10 a. m.

Business Men of Spartanburg, S. C., have started a movement to raise funds for the purpose of rebuilding the Tryon-Saluda mountain highway, which was badly damaged in the recent storms. The road was built two years ago by Polk County, S. C., at a cost of $60,000.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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St. Paul, Minnesota, Contemplates Paving to Cost Nearly $264,000

The City Council of St. Paul, Minn., has under consideration plans for paving on five streets, which will cost $263,958, according to estimates. The largest item is that of Grand Avenue which is to be paved with creosoted wood block at an estimated cost of $124,849.

Other items include Mounds Boulevard, which is to be paved with concrete at a cost of $51,054 and for which the final order has been passed; Berry Avenue which is to be widened to 53 ft., at a cost of $6,800; Capitol Avenue on which a pavement of creosoted wood block is to be laid at an estimated cost of $73,835, and St. Anthony Avenue which is to be graded at a cost of $8,255.

Fix Route of the William Penn Highway in Pennsylvania

The Board of Governors of the William Penn Highway Association completed laying out the route of the highway at a recent meeting held in Philadelphia, Pa., where the route will terminate.

The highway will extend from the Pike's Peak Ocean-to-Ocean Highway at the Ohio state line, over the Steubenville Pike to Pittsburgh, Pa. From Pittsburgh, the route will be through Wilkinsburg and New Alexandria, to Blairsville, Armagh and Johnstown, and thence to Ebensburg, Altoona, over the Allegheny Mountains to Huntington, through the Juniata River valley to Lewiston and along the Susquehanna River through Millerstown to Harrisburg, Lebanon, Reading and Pottstown. From Pottstown it will run through Norristown to the Philadelphia city line.

The Pennsylvania State Highway Department has authorized markers for the highway, consisting of a keystone with the word "Penn" painted on it in yellow. These are now being placed in the neighborhood of Huntington, Pa.

The road, which will be approximately 320 miles long, runs through portions of 15 Pennsylvania counties and will be formally opened during the first week in October when an automobile will be run over it from Pittsburgh to Philadelphia.

Large Paving Contract Awarded in Seattle, Washington

The Board of Public Works of Seattle, Washington, has recently awarded a large contract for paving East Marginal Way.

East Marginal Way is a new street situated on the eastern shore of the Duwamish Waterway and extending from West Spokane Street to the southern city limits—a distance of about four miles. It will be paved with brick except for a short section of wood block. The contract was awarded to Holt & Jeffery, of Seattle, at $114,149.95.

San Francisco-Oakland Bridge Hearings to be Held Next Week

Public hearings on the proposed bridge to connect San Francisco and Oakland, Cal., will be held August 15, at San Francisco and August 17 at Oakland.

As noted in "Good Roads" for July 8, the proposed bridge would cost $22,000,000, this estimate being based on two spans of 600 ft. lateral and 210 ft. vertical clearance and two lift spans of 210 ft. vertical clearance, with 250-ft steel trusses placed on cylindrical concrete piers resting on piles. The length across the bay, exclusive of approaches, would be three miles.

The plans call for four railroad tracks, two each for overland and interuban traffic, and three roadways, one of which is designed for automobiles exclusively.

The board of engineers to review the plans and estimates is composed of Lieut. Col. Thomas H. Rees, Lieut. Col. Charles L. Potter and Major George B. Pillsbury, of the Engineer Corps, U. S. A.

Private Business Aids Road Work in Pennsylvania

An instance of cooperation in public work on the part of a private business enterprise has recently been reported from Pennsylvania.

The maintenance division of State Highway Department recently ordered 750 tons of cinders at the market price of 7 cts. per ton from the New Jersey Zinc Company of Pennsylvania, which has a plant at Palmerton, Carbon County. Upon receipt of the requisitions the company sent them back to the department with the request that they be reissued, as the company would be glad to furnish the cinders free. The writer of the letter also advised the department that the company was interested in the work of road improvement and would be glad to cooperate with the State Highway Department by furnishing material.

Thomas A. Edison Advocates State Control of New Jersey Roads

In a communication to the New Roads Legislative Committee, recently appointed by Governor Fielder of New Jersey, Thomas A. Edison, the inventor, advocates state control of all roads.

Mr. Edison also suggested the employment by New Jersey of an expert French road engineer and the use of concrete only for new road construction.

The recommendations were read at a meeting of the committee which went on record in support of the Egan bill providing for a $7,000,000 bond issue for road construction. The bill will be submitted to a vote of the people at the November election.

COMING MEETINGS

August 16-18—League of Wisconsin Municipalities—Annual meeting, Oshkosh, Wis. Secretary, Ford H. McGregor, Madison, Wis.

August 17-19—Texas Good Roads Association—Annual meeting, Modina Lake, San Antonio, Tex. Secretary, D. E. Colp, San Antonio, Tex.

August 21-23—Union of Canadian Municipalities—Sixteenth annual convention, Montreal, P. Q. Secretary-Treasurer, W. D. Lighthall, K. C., Montreal, P. Q.

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

American Association of State Highway Officials

A meeting of the American Association of State Highway Officials has been called by President Henry G. Shirley, Chief Engineer of the Maryland State Roads Commission, for Tuesday of next week, August 15, at Washington, D. C.

Burlington Way Good Roads Association

The fifth annual convention of the Burlington Way Good Roads Association will be held at Jacksonville, Ill., on Monday, August 14. The program will include a number of addresses and a barbecue. W. J. Brady and Carl H. Weber of Jacksonville are President and Secretary-Treasurer, respectively, of the organization.

On Wednesday, the 16th, the state highway officials of the various states will meet with Secretary of Agriculture David F. Houston, at his request, for the purpose of discussing ways and means of work under the new federal aid law.

PERSONAL NOTES

L. McLean Hunter has been appointed Pavement Engineer of Ottawa, Ont.

Edward J. O'Neil has been appointed Superintendent of Road Construction for Essex County, Ontario.

E. M. Harrison has been placed in charge of the Department of Street and Public Improvements by Mayor L. F. Dodd, of Montclair, N. J.

Ernest G. Barrow of the contracting firm of Barrow & Hunting, Toronto, Ont., and formerly City Engineer of Hamilton, Ont., died recently at Toronto.

Chas. A. Mullen of New York, N. Y., at one time Commissioner of Public Works of Milwaukee, Wis., has been engaged as Pavement Inspector by the City of Montreal, P. Q.

George A. Ricker, a consulting engineer of Albany, N. Y., has been employed by the Portland Cement Association to have charge of the Kansas City office. Mr. Ricker was formerly First Deputy Commissioner of Highways of New York State.

TRADE NOTES

The Chicago Steel Tape Co., Chicago, Ill., has issued a 36-page booklet printed in colors, describing its line of steel tapes, marking pins, leveling rods and other articles for field work.

The Clydesdale Brick & Clay Co., of Pittsburgh, Pa., has become a licensee of the Dunn Wire-Cut Lug Brick Co., of Conneaut, Ohio. The Clydesdale Company has a new plant at Elwood, Pa., which will have a capacity of 100,000 paving bricks per day. H. J. Orth is President of the company and W. W. Cunningham is Vice President and General Manager. It is stated that the company intends to double the plant's capacity in the near future.

"Kerosene Power, the Low Priced Road Builder," is the title of a 16-page booklet issued by the International Harvester Company of America, Inc., of Chicago, Ill. The booklet is devoted to descriptions of the various kerosene tractors built by the company and is profusely illustrated by halftones showing the various models in operation. Besides the descriptions of the machines the booklet contains accounts of road work done with them. There is also a section describing the construction of a road drag; an extract from an article by Professor Agg of the Iowa State College, on the design and construction of earth roads; and a section on the use of elevating graders.

NEWS NOTES

The Kansas 365-Day Road Club is back of a movement for a comprehensive road building law and the creation of a state highway department.

The Cash Value of Road Improvement is well illustrated by a news item which appeared recently in the Cherokee (Iowa) "Times." Land along a road between Sioux City and Leeds, Ia., it is reported, doubled in value after the improvement of the road was ordered. In another instance land that had been held at $300 advanced to $500 because of road betterment.

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State Highway Officials' Association Meets to Discuss Tentative Rules for Federal Aid Act

The American Association of State Highway Officials met at the Raleigh Hotel, Washington, D. C., on August 15, for the purpose of discussing the tentative draft of the rules and regulations which the secretary of agriculture is authorized to adopt under the Federal aid act. Representatives of 26 states were present. Secretary of Agriculture Houston had invited the state officials to meet him on August 16 and the meeting on the 15th was for preliminary study and discussion.

The discussion was aimed mainly at the meaning of certain of the regulations and the changes suggested by the meeting were largely for the purpose of rendering the interpretation more certain.

The meeting on August 16 was held in the National Museum and 35 states were represented. The tentative draft was again considered and the changes adopted on the 15th were presented. Secretary Houston addressed the meeting and there was evident a desire to secure cooperation between the state and federal forces which promises well for efficient work.

The tentative draft of the rules and regulations as adopted by the state officials is printed in full below:

Regulation 1. Definitions.

For the purposes of these regulations, the following terms shall be construed, respectively, to mean:

Section. 1. The Federal Aid Road Act, or the Act. An act of Congress entitled "An Act to provide that the United States shall aid the States in the construction of rural post roads, and for other purposes," approved July 11, 1916 (Public—No. 156—64th Congress).

Sec. 2. The Secretary. The Secretary of Agriculture of the United States.

Sec. 3. Office of Public Roads. The Office of Public Roads and Rural Engineering of the United States Department of Agriculture.

Sec. 4. Ten-per-cent. fund. Items for engineering, inspection, and unforseen contingencies, not exceeding ten per cent. of the total estimated cost of the work.

Regulation 2. Application of Regulations.

Sec. 1. These regulations apply to all provisions, except section eight of the Act and shall not be applied to section eight unless hereafter authorized or required by order of the Secretary.

Sec. 2. If a State cannot constitutionally engage in any work of internal improvements, and any number of its counties shall appropriate or provide the proportion or share needed to be raised in order to entitle such State to its part of the appropriation apportioned to it, these regulations shall apply as fully as in the case of a State whose constitution does not prohibit it from engaging in any work of internal improvements.

Regulation 3. Information for the Secretary.

Sec. 1. Before an agreement is made upon any road or roads to be constructed in a State, or the character and method of construction, upon request of the Secretary there shall be furnished to him, by or on behalf of the State, general information as to its laws affecting roads and the authority of State and local officials in reference to the construction and maintenance of roads; as to schemes for future construction; and as to provisions made, or to be made, for constructing and maintaining roads upon which it is contemplated that the expenditure of money appropriated by or under the Act will be proposed. The information furnished shall be sufficient to enable the Secretary to determine whether it is likely that the money apportioned to the State will be expended, and the roads constructed by the aid of the money will be properly maintained, in accordance with the terms of the Act.

Sec. 2. Such information as may be requested by the Secretary or his authorized representative, relating to the maintenance of roads constructed under the provisions of the Act, shall be furnished, from time to time, by the State Highway Departments, on forms supplied by the Office of Public Roads.

Sec. 3. Data furnished by or on behalf of a State shall be supplemented by such reports of the Office of Public Roads as the Secretary may from time to time require before he decides whether the State has complied with the terms of the Act or has presented a project statement which should be approved.

Regulation 4. Project Statements.

Sec. 1. A project statement shall contain all information necessary to enable the Secretary to ascertain (a) whether the project conforms to the requirements of the Act; (b) whether adequate funds, or their equivalent, are or will be available by or on behalf of the State for construction; (c) what purpose the project will serve and how it correlates with the other highway work of the State; (d) the administrative control of, and responsibility for, the project; (e) the practicability and economy of the project from an engineering and construction standpoint; (f) the adequacy of the plans and provisions for proper maintenance of roads; and (g) the approximate amount of Federal aid desired.

Sec. 2. Suitable forms for project statements will be supplied by the Office of Public Roads.

Sec. 3. Project statements for any fiscal year may be submitted at any time after the apportionment for that year shall have been made.

Sec. 4. Projects will be deemed preferred, and recommended for approval, by the State Highway Department in the order in which the project statements are submitted, unless it be otherwise specified in writing; but the Secretary may, in his discretion, consider the projects in a different order.

Sec. 5. Each project statement shall be accompanied by a sketch map, showing the location of the proposed project and all main contiguous transportation features.

Sec. 6. Suitable samples of materials suggested for use in the construction of a project shall be submitted to the Office of Public Roads, whenever requested by it, for examination prior to the Secretary's decision on the project statement.

Sec. 7. Where any part of the cost of a project is to be furnished by a county or other local subdivision or subdivisions of a State, the project statement shall be accompanied by certified copy of each resolution or order, if any, of the appropriate local officials affecting the funds which are or will be made available for the supervision of the construction of the road and of the expenditure of the money provided or to be provided for paying such cost.

Regulation 5. Surveys, Plans, Specifications and Estimates.

Sec. 1. Surveys and plans shall show, in convenient form and sufficient detail, according to accepted engineering practice, necessary data, in connection with the specifications and estimates, to enable the Secretary to ascertain and pass upon location, grades, drainage, bridges, other structures, special and unusual features, the work to be performed, and the probable cost thereof.

Sec. 2. Specifications shall set forth the proposed method of construction, type of construction, materials to be used and other essentials, in such detail as to afford complete knowledge of all steps to be taken in the construction of the project.

Sec. 3. The estimate for each project shall show the estimated quantity and cost of each item of construction in detail and, separately, the ten per cent. fund, and shall not include any expense of advertising.

Sec. 4. Rights of way and incidental damages to adjoining lands, necessary for any project shall be provided by or on behalf of the State, and the expense thereof shall not be included in the estimate or paid in any part, directly or indirectly, by the Federal Government.

Sec. 5. Grade crossings shall be avoided where practicable. The estimated cost of eliminating a grade crossing shall not include any amount the State, county or other civil subdivision has received, is to receive, or is entitled to receive, directly or indirectly, as reimbursement or payment from the owner of a public utility, for or on account of such elimination.

Sec. 6. No part of the expense of making preliminary surveys, plans, specifications or estimates prior to the acceptance of the project by the Secretary, by or on behalf of the State, shall be included in the estimate or paid by the Federal Government.

Sec. 7. When plans, specifications and estimates have been approved by the Secretary, no alteration thereof shall be made without his approval or that of his representative.

Sec. 8. For all projects for which statements are submitted after December 31, 1916, standards governing the form and arrangement of plans, specifications and estimates will be hereafter prescribed and promulgated by the Secretary.

Regulation 6. Project Agreements.

Sec. 1. A project agreement between the State Highway Department and the Secretary shall be executed, in triplicate, on a form furnished by him, previous to commencement of the construction of the project.

Regulation 7. Contracts.

Sec. 1. Prior to the approval of the first project in a State, copies of the forms of the contracts, together with all documents referred to therein or made part thereof, and of the contractor's bonds proposed to be used under the Act shall be submitted to the Secretary. No alteration of such forms shall be made until it is approved by the Secretary.

Sec. 2. Before work is begun on any project, adequate means, either by advertising or by other devices appropriate for the purpose, to make certain that the Federal money set aside for the project is spent in the most economical and practical way to accomplish the objects for which it was appropriated.

Sec. 3. Immediately on publication of advertisements copies thereof shall be furnished to the Office of Public Roads.

Sec. 4. Bids shall be in such form that the unit prices at which the various services are to be performed, and the various materials furnished, will be clearly shown.

Sec. 5. Copy of the tabulated bid prices, showing the unit prices and the totals of each bid for every project, shall be furnished promptly to the Office of Public Roads.

Sec. 6. In advance of the acceptance of any bid, sufficient notice of the time and place the contract is to be awarded shall be given to the Office of Public Roads to enable it, if it so desire, to have a representative present. When a bid has been accepted prompt notice thereof shall be given to the Office of Public Roads.

Sec. 7. If the contract be awarded to any other than the lowest responsible bidder, the Federal Government shall not pay more than its pro rata share of the lowest responsible bid, unless it be satisfactorily shown that it was advantageous to the work to accept the higher bid.

Sec. 8. A copy of each contract as executed shall be immediately certified by the State Highway Department and furnished to the Office of Public Roads.

Sec. 9. The specifications and plans shall be made a part of the contract.

Sec. 10. No alteration in such contract shall be made without the approval of the Secretary.

Regulation 8. Construction Work and Labor.

Sec. 1. Suitable samples of materials to be used in construction work shall be submitted, by or on behalf of the State Highway Department, to the Office of Public Roads whenever requested.

Sec. 2. Unless otherwise stipulated in writing by the Secretary or his authorized representative, materials for the construction of any project shall, prior to use, be tested for conformity with specifications, according to methods prescribed, or approved, by the Office of Public Roads.

Sec. 3. Unless otherwise specifically stipulated in the project agreement, bridges, viaducts and under-passes shall have clear width of roadway of not less than 16 feet, and clear head room of not less than 14 feet for a width of 8 feet at the center.

Sec. 4. No part of the money apportioned under the Act shall be used, directly or indirectly, to pay, or to reimburse a State, county or local subdivision for the payment of, any premium or royalty on any patented or proprietary material, specification, process, or type of construction, unless the work is open to actual competitive bidding.

Sec. 5. The supervision of each project by the State Highway Department shall include adequate inspection throughout the course of construction, to be paid out of the ten per cent. fund.

Sec. 6. Written notice of commencement and completion of construction work on any project shall be given promptly by the State Highway Department to the Office of Public Roads.

Sec. 7. Reports of the progress of construction, showing force employed and work done, shall be furnished, from time to time, whenever requested by the Secretary or his authorized representative.

Sec. 8. Labor, teams, materials and equipment furnished, in lieu of money, by or on behalf of the State Highway Department on construction work shall be used only on such terms and conditions as are set forth in the project agreement, unless amended to meet changed conditions.

Regulation 9. Records and Cost Keeping.

Sec. 1. A separate account for each project shall be kept by or under the direction of the State Highway Department. The account shall be kept in such way as to enable the Secretary, or his authorized representative, to ascertain at any time the expenditures on and the liabilities against the project and, separately, the condition of the ten per cent. fund.

Sec. 2. Such other records of contract and force account work, and of inspections and tests by or on behalf of the State, shall be kept, by or under the direction of the State Highway Department, as will enable the Secretary, or his authorized representative, at any time to determine the condition of the construction and maintenance of, and the cost of the construction work and labor done on, any project, to the State and Federal Government.

Sec. 3. The accounts and records, together with all supporting documents, shall be open, at all times, to the inspection of the Secretary, or his authorized representative, and copies thereof shall be furnished when requested.

Sec. 4. Certified copies of payrolls on force account work and of all vouchers for other expenditures shall be furnished, whenever requested by the Secretary or his authorized representative.

Sec. 5. Unit costs to the State and Federal Government on any project shall be kept, on forms furnished by the Office of Public Roads, whenever requested by the Secretary or his authorized representative.

Regulation 10. Payments.

Sec. 1. Vouchers, in the form provided by the Secretary and certified as therein prescribed, showing amounts expended on any project and amount claimed to be due from the Federal Government on account thereof, shall be submitted by the State Highway Department to the Office of Public Roads, either after completion of construction of the project or, if the Secretary has determined to make payments as the construction progresses, at intervals of not less than one month.

Regulation 11. Office of Public Roads.

Sec. 1. Papers and documents required by the Act or these regulations to be submitted to the Secretary may be delivered to the Office of Public Roads and from the date of such delivery shall be deemed submitted.

Sec. 2. The Director of the Office of Public Roads, and such other officials and employees thereof as the Director, from time to time, may designate for the purpose, shall be deemed the authorized representatives of the Secretary within the meaning of that phrase as used in these regulations.

The Essex Bridge between Salem and Beverly, Mass., is to be rebuilt at a cost of $171,367. The contract was recently awarded to the Holbrook, Cabot & Rollins Corporation, Boston, Mass. The work is to be completed by October 1, 1917.

GOOD ROADS

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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Large Paving Bond Issue Loses at Election in Cleveland, Ohio

At the recent primary election in Cleveland, O., the proposed bond issue of $3,500,000 for the improvement and extension of a number of streets failed to receive the necessary two-thirds vote.

This bond issue was part of an extensive paving program in Cleveland, details of which were given in "Good Roads" for June 10. It was proposed to expend a total of approximately $10,500,000, of which Cuyahoga County was to contribute $2,000,000.

The issue was approved by the city administration, the Cleveland Chamber of Commerce and other civic organizations. As a result of the vote, the paving program, it is said, will be indefinitely delayed, there being no money available from other sources to carry on the work.

Reduced Freight Rates on Road Materials in West Virginia

Chief State Road Engineer A. D. Williams of West Virginia has succeeded in obtaining considerable reductions in freight rates on road materials within the State of West Virginia.

Mr. Williams has been engaged in this work for some time and has recently completed arrangements with the Baltimore & Ohio, Chesapeake & Ohio, Western Maryland, Virginian, Norfolk & Western, and Kanawha & Michigan Railroads whereby rates averaging about 50 per cent. of the regular tariffs have been obtained. The concessions were secured under a ruling of the Interstate Commerce Commission permitting railroads to make reductions to the federal government, to a state or to the whole people of a state. The rates apply to materials produced and delivered within the state, the reduction amounting to an average of about ½ cent per ton-mile.

Attorney-General Turner, of Ohio, Defines Highway Repairs

A recent ruling by State Attorney-General Turner, of Ohio, tells what is meant by highway repairs under the laws of Ohio.

The first essential is that there must have been an improvement of the highway and that this improvement must have fallen into decay, either slight or extensive. Some substantial part of the original improvement must remain, however, and to constitute a repair, the proposed operation must contemplate the use of that part of the old improvement still remaining and must further contemplate a completed work that will be substantially like the original.

It is held that the State Highway Commissioner is not authorized to pay a contractor an estimate based on material delivered on the site of an improvement and not yet incorporated in the work.

New York State Receives Bids on Nearly 200 Miles of Highways

The New York State Commission of Highways received bids on August 14 and 16 for the construction of 186.74 miles of highways, located in 26 counties. The total amount of the low bids was $2,587,363.92.

Bids were called for on a total of 217.90 miles, but no proposals were received on eight contracts aggregating 30.16 miles.

The names of the low bidders and other details concerning the work are given in the subjoined table:

County	Mileage	Low Bidder	Amount of Bid
Albany	0.10	Brown, Lowe Co., Schenectady.	$1,544.50
Broome	4.70	T. H. Gill Co., Binghamton	52,486.50
Cayuga	5.45	Frank Malone, Syracuse	72,209.45
Cortland	6.07	Michael O'Brien, Cortland	73,747.50
Delaware	6.51	Albany Const. Co., Albany	92,554.25
Erie	0.91	No bids received	......
	3.54	William F. Felton, Buffalo	51,981.30
	6.03	William F. Felton, Buffalo	62,120.25
Essex	4.95	No bids received	......
Fulton	2.80	No bids received	......
Hamilton	6.74	Albany Constr. Co., Albany	117,038.50
Herkimer	5.84	No bids received	......
Jefferson	5.03	Pathfinder Constr. Co., Fulton	61,464.10
Montgomery	2.49	No bids received	......
Niagara	2.38	Cold Sp'g Constr. Co., Buffalo.	25,442.50
Oneida	6.15	Albany Constr. Co., Albany	75,608.50
Ontario	3.95	Chambers & Barnes, Rochester	40,219.50
Oswego	0.57	Samuel Bonn, Syracuse	8,731.40
Rensselaer	7.20	Lane Constr. Corp., Meriden Conn.	91,571.25
Rockland	8.62	Samuel Beskin, Beacon	71,930.00
Seneca	2.75	Thomas F. Murray, Le Roy	37,709.40
Schenectady	0.24	McMahon & Farrington, Waterloo	3,162.10
	1.95	J. J. Malloy, Schenectady	19,330.50
Tioga	6.00	Lane Const. Corpn., Meriden Conn.	68,043.75
Tompkins	5.86	D. W. Robbins, Inc., New York	86,956.20
Ulster	3.12	John A. Jova, Inc., Newburgh.	35,867.01
Washington	1.43	Keeseville Road Co., Inc., Keeseville	62,961.50
Allegany	9.07	Frank J. Foote, Nunda	111,063.00
Broome	6.93	T. H. Gill Co., Binghamton	103,690.50
Cattaraugus	4.73	William F. Felton, Buffalo	75,952.25
Delaware	3.39	Woodruff-Edgecomb Co., East Branch	46,604.00
Erie	3.18	Carlisle A. Landel, Tonawanda	43,807.00
	1.12	A. J. Shaw, Jr., & Geo. Perrin, Batavia	38,619.00
	5.09	Frank J. Foote, Nunda	60,117.50
Franklin	1.99	A. F. McConville, Ogdensburg	67,100.75
Fulton	2.90	No bids received	......
Herkimer	5.67	No bids received	......
Jefferson	4.05	P. J. Kennedy, Utica	59,819.50
Monroe	3.69	Michael Murphy, Rochester	38,994.50
Niagara	0.61	J. Johnson Constr. Co., Buffalo	22,546.10
Oneida	5.74	Albany Constr. Co., Albany	70,022.00
Ontario	2.26	Atlanta Constr. Co., Atlanta	26,961.01
Orleans	1.32	F. H. Rhody, Albion	89,975.00
Oswego	6.36	Samuel Bonn Syracuse	74,840.65
Rensselaer	4.87	Fred Ellis, Melrose, Mass.	57,590.50
St Lawrence	4.60	No bids received	......
Schenectady	6.33	Albany Constr. Co., Albany	74,500.56
Schuyler	3.01	Willis L. Frost, Watkins	29,888.00
Seneca	4.89	J. W. Brennan Constr. Co., Inc., Geneva	59,908.50
Tioga	5.50	D. W. Robbins, Inc., New York	72,025.50
Tompkins	3.38	Fort Schuyler Constr. Co., Inc., Utica	42,748.00
Ulster	0.55	Fallkill Constr. Co., Poughkeepsie	13,894.50
Washington	4.58	Keeseville Road Co., Inc., Keeseville	47,732.00
Westchester	2.74	James V. Troin, Mt. Vernon	46,213.70
Total	217.90		$2,587,363.92

COMING MEETINGS

August 17-19—Texas Good Roads Association—Annual meeting, Modina Lake, San Antonio, Tex. Secretary, D. E. Colp, San Antonio, Tex.

August 21-23—Union of Canadian Municipalities—Sixteenth annual convention, Montreal, P. Q. Secretary-Treasurer, W. D. Lighthall, K. C., Montreal, P. Q.

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

September 26-28—League of Virginia Municipalities—Annual meeting, Clifton Forge, Va. Secretary, Luther C. Brinson, Portsmouth, Va.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

National Paving Brick Manufacturers

The National Paving Brick Manufacturers' Association has extended an invitation to automobile clubs, chambers of commerce, engineers and others interested in road building, to attend a conference at the Deming Hotel, Terre Haute, Ind., on October 5 and 6. In connection with the conference, a demonstration of brick paving will be made nearby in the vicinity of Paris, Ill.

The association has made a compilation which shows that approximately $2,500,000,000 will be expended for road improvement during the next five years. It is felt that the association should do its part toward securing the best and most economical construction of brick pavements, so that whatever amount of the money to be expended comes to the paving brick industry, the public will receive full value. Hence the conference.

MEETING

Massachusetts Highway Association

The Massachusetts Highway Association, the active membership of which is composed of state, city and town officials from the New England States, held its regular quarterly meeting at Providence, R. I., on August 10. About 250 members attended.

The members were received by Mayor Gainer of Providence at City Hall and, after visiting the State House, Brown University and other points of interest in the city, were taken on a 30-mile automobile trip over the state roads, to Hamilton, R. I., where a clambake was served.

A program of out of door sports had to be dispensed with on account of rain, but a musical program was rendered during and after the dinner.

The arrangements for the meeting were in charge of Peter J. Lannon, Clerk, and Irving W. Patterson, Chief Engineer of the Rhode Island Board of Public Roads, and Walter L. Slade, Commissioner of Public Works, and M. H. Brondson, Deputy Commissioner, of Providence.

Among the state officials present at the meeting were John F. Richmond, Chairman; William C. Peckham, Secretary, and Benjamin F. Robinson, Abram L. Atwood and Frank Cole of the Rhode Island Board of Public Roads; Col. William D. Sohier, Chairman; Commissioner James W. Synan, Arthur W. Dean, Chief Engineer; J. M. McCarthy, Chief Clerk, and Frank C. Pillsbury and William R. Farrington, Division Engineers of the Massachusetts Highway Commission.

PERSONAL NOTES

Paul E. Kressey has been appointed City Engineer of Chino, Cal.

H. P. Kerr has been appointed City Engineer of Tillamook, Ore., vice Ross Shreve, resigned.

G. N. Wood has resigned as City Engineer of Chanute, Kan., to accept a similar position at Douglas, Ariz.

J. C. Watts, who was Deputy City Engineer of Troy, N. Y., has been appointed Engineer of the Harbor and Dock Commission.

C. W. Pratt has been appointed City Engineer of Chanute, Kan., succeeding G. N. Wood, whose resignation is noted elsewhere.

G. B. Arthur has been appointed District Engineer of the Portland Cement Association. His headquarters are at Parkersburg, W. Va.

F. X. Bode has been appointed Deputy City Engineer of Troy, N. Y., succeeding J. C. Watts, whose appointment to another position under the city government is noted elsewhere in this column.

Austin B. Fletcher, State Highway Engineer of California, has been granted leave of absence from August 16 to October 1, in order to assist at Washington, D. C., in organizing the work of the new road bureau through which the government will handle the $85,000,000 road fund.

NEWS OF THE TRADE

The Holt Manufacturing Co., Stockton, Cal., has issued Bulletin C-108, descriptive of the Holt "Caterpillar" tractor. The bulletin is in the form of a pamphlet and is illustrated.

Clarence D. Pollock, M. Am. Soc. C. E., and George A. Taber, M. Am. Soc. C. E., have formed the firm of Pollock & Taber, consulting engineers, with offices in the Park Row Building, New York, N. Y. The firm will specialize on pavements, roads, water supply, drainage, sewerage and sewage disposal.

Four Contracts for Paving Approximately 100 Alleys have recently been awarded in Baltimore, Md. It is stated that these contracts will be completed in a few weeks.

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NEW YORK, AUGUST 26, 1916

Number
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Bonds of Douglas County, Nebraska, Held Invalid by Court

District Judge Leslie has rendered a decision in the suit brought by the Omaha, Neb., Real Estate Exchange, holding that the proposed $1,700,000 paving and grading bond issue in Douglas County, Neb., is invalid. The county will appeal to the Supreme Court.

The bond issue was voted on at the regular primary election last spring and received a small majority of the vote on that particular question, but did not receive a majority of the total vote cast at the primary. For this reason Judge Leslie decided against the validity of the issue.

Fifth Annual Observance of State Good Roads Days in Alabama

In accordance with an act of the last Legislature, the State of Alabama observed two Good Roads Days on August 14 and 15. This is the fifth annual observance of the days in that state, but it is the first time the observance has taken place under legislative enactment.

Reports received by the Alabama Good Roads Association indicate that more than 100,000 men worked on the public roads during the two days. In the southern part of the state efforts were made to repair the damage resulting from recent floods.

Commonweath Club of California Favors $15,000,000 Bond Issue

In a recent report to the Commonwealth Club of California, the club's Committee on Highways favored the proposed $15,000,000 bond issue for highway construction which is to be submitted to a vote of the people. The club in 1910 was opposed to the $18,000,000 road bond issue under which the state is now working.

The report finds that the state has a 900-mile coast highway and a 620-mile central valley highway in course of construction, with gaps in the former aggregating 160 miles and 270 miles in the latter. There are also, the report states, 100 miles of the coast highway and 135 miles of the valley highway described as "graded or unconstructed."

These portions may be finished under the existing bond issue, according to the committee, which goes on to apportion the expenditures thus far as follows:

Materials and construction, 84.32 per cent.; stores and equipment, 1.19 per cent.; preliminary or advance surveys, 1.90 per cent.; surveying and inspection, 8.18 per cent.; administration, 4.41 per cent.

The average cost of all highways, including overhead, is given in the report as $12,000 a mile, exclusive of the three-mile Yolo Causeway which cost approximately $400,000 to build. The average cost of concrete highway, including overhead, is given as $16,000 a mile. These averages do not include right of way nor the cost of bridges.

The report says: "These highways are expensive, but if they give us what we want and what we need, then the expense is an investment which will bear fruit in the rapid development of the state."

Minnesota Has 1,133 Miles of State Rural Highways in 18 Counties

The Minnesota Highway Journal, issued by the State Highway Commission of Minnesota, reports a total of 1,133.90 miles of roads, officially designated as state rural highways, either completed or under construction in 18 counties. The total cost of the roads is given as $3,254,032.50.

There are 50 highways in all, of various types and the average cost per mile is stated as $2,869.71. Details of the work are given in the subjoined table:

County	Mileage	Class	Total Cost	Cost per mile
Aitkin	20.10	Surfaced	$56,378.86	$2,805.00
	19.00	"	56,112.67	2,953.29
	64.00	"	212,859.82	3,326.00
Beltrami	5.50	"	14,868.24	2,713.00
	12.73	"	23,704.94	1,862.00
	6.50	"	15,833.70	2,436.00
& Koochiching	45.11	"	108,259.31	2,399.00
	33.50	"	121.375.00	3,623.00
	34.81	"	149,083.11	4,283.00
Blue Earth	11.30	Gravel	21,773.76	1,926.00
Brown	29.00	"	57,378.17	1,979.00
Carlton	28.02	"	103,000.00	3,675.00
Cass	22.59	Earth	62,842.60	2,781.00
	71.70	Surfaced	213,358.97	3,003.00
	45.65	"	74,342.14	1,629.00
& Hubbard	29.50	"	88,021.75	2,933.00
	29.25	"	73,038.88	2,497.00
Hennepin	2.99	Concrete	51,341.20	17,272.00
Hubbard	9.00	Surfaced	5,393.71	599.30
	46.87	"	74,667.15	1,593.07
	10.85	"	17,429.04	1,606.00
Koochiching	23.00	Earth	32,114.46	1,396.00
	75.10	"	155,723.74	2,074.00
	21.70	"	22,257.14	1,025.00
	52.77	"	115,879.21	2,196.00
Lincoln	20.40	Gravel	41,570.65	2,038.00
Lyon	24.50	"	45,785.57	1,869.00
Nicollet	27.50	"	55,392.29	2,014.00
	12.50	"	30,556.26	2,445.00
Pennington	21.00	"	47,439.88	2,259.00
Pine	30.00	Earth	63,819.96	2,127.00
Redwood	5.75	Gravel	7,982.24	1,388.00
	6.00	"	11,475.04	1,913.00
	22.93	"	56,498.68	2,464.00
	8.00	"	28,960.00	3,620.00
	18.50	"	56,548.20	3,057.00
St Louis	32.50	"	148,095.44	4,556.00
Winona	6.86	Concrete	56,874.64	8,290.00
	4.35	"	30,613.26	7,038.00
	4.60	"	33,518.22	7,287.00
	27.05	Brick & Mac.	176,988.10	6,543.00
	20.85	"	110,744.24	5,311.00
	7.70	"	50,641.90	6,576.00
	7.02	Gravel	30,265.00	4,311.00
	4.40	"	19,434.20	4,417.00
	4.95	"	19,833.30	4,007.00
	6.00	"	26,118.00	4,353.00
	10.50	Gravel & Mac.	51,172.00	4,873.00
Yellow Medicine	18.50	Gravel	54,500.00	2,946.00
	31.00	"	72,167.86	2,328.00
Total	1,133.90		$3,254,032.50	$2,869.71

Increase in Motor Driven Traffic on State Highways of Massachusetts

According to statistics compiled by the State Highway Commission of Massachusetts, motor-driven traffic on the Massachusetts state highway system has increased at the rate of 70 per cent. a year since 1909.

It was in 1909 that the commission made its first traffic census at 238 points on the system. The counts were made during 14 hours each, for seven consecutive days, and the results showed that 61 per cent. of all vehicles were horse-drawn while only 39 per cent. were self-propelled.

In 1912 conditions were reversed, the traffic census showing that motor-driven vehicles constituted 63 per cent. of the traffic. The annual report of the commission for 1915 showed that 82.5 per cent. of all traffic was motor-driven.

During the period from 1909 to 1915, the total traffic on all roads increased 145 per cent. but motor vehicle traffic increased 420 per cent. and the number of horse-drawn vehicles decreased 30 per cent. There was an increase of 230 per cent. in motor truck traffic from 1912 to 1915.

Ohio Receives Bids for Half Million Dollars' Worth of Road Work

Bids for highway work amounting to $509,531.50 were received recently by the Ohio State Highway Department. The work is to be done in 21 counties of the state and a total of 45.88 miles is involved. The names of the low bidders and other details are given in the subjoined table.

DETAILS OF ROAD CONTRACTS AWARDED IN OHIO

County	Road	Miles	Type	Low Bidder	Address	Amount of Bid
Allen	Lime-Kenton	2.00	Brick	C. E. Williams,	Grand Rapids, Mich.	$55,601.79
	Alternate	2.00	Asph. Concrete	C. E. Williams,	Grand Rapids, Mich	50,991.93
Athens	Logan-Athens	0.37	Brick	Marriner & Sons,	Athens	5,422.37
Auglaize	Kenton-Wapakoneta	0.61	Br., Con., W. B. Mac.	W. I. Howell,	Wapakoneta	21,978.24
Gallia	Ohio River	0.78	W. B. Macadam	W. H. Martt,	Gallipolis	6,994.00
Geauga	Cleveland-Meadville	5.64	Brick & Concrete	H. W. Curry & Co.,	Eaton	72,550.00
Henry	Toledo-Napoleon	3.55	W. B. Macadam	J. A. Westrick,	Holgate	36,600.35
Hocking	Lancaster-Logan	(a)	....	S. C. Kisener & Sons,	Delaware	2,500.00
Lawrence	Ohio River	1.06	Bit. Macadam	Trippeer & Patterson,	Columbus	14,327.26
	Alternate	1.06	R. F. Concrete	John M. Capper,	Kettshill	16,892.80
	Ohio River	2.19	Bit. Macadam	Seiple & Wolf,	Youngstown	17,721.19
	Alternate	2.19	R. F. Concrete	Carl & George Meahl,	Ironton	30,334.35
	Ironton-Miller	1.00	Bit. Macadam	Trippeer & Patterson,	Columbus	11,028.05
Logan	Bellefontaine-Richwood	0.34	Concrete	O'Briant & Gregg,	Marysville	5,994.98
Mahoning	Youngstown-Akron	1.72	Brick	Doolittle & Garland,	Kent	24,859.10
	Youngstown-Lowellville	2.00	Brick	Smith Construction Co.,	Youngstown	35,478.61
Mercer	Celina-Wabash	0.50	Concrete	Burnet & Christen,	Rockford	7,190.42
Monroe	Woodsfield-Barnesville	3.30	(b)	Green & Getman,	Kent	16,687.44
Perry	Newark-New Lexington	1.90	W. B. Macadam	Wilson-Yardley Co.,	Newark	22,003.82
Pickaway	Cincinnati-Zanesville	2.63	W. B. Macadam	Oather M. Junk,	Chillicothe	14,200.00
Preble	Dayton-Indianapolis	4.45	Bit. Macadam	H. W. Curry & Co.,	Eaton	33,860.22
Putnam	Findlay-Delphos	1.47	W. B. Macadam	Carey & McElroy,	Ada	6,933.86
	Ottawa-Findlay	2.15	W. B. Macadam	O. L. Smith,	Leipsic	11,764.74
	Findlay-Delphos	0.37	R. F. Concrete	J. W. Acton,	Vaughnsville	7,733.86
Ross	Portsmouth-Columbus	0.57	Brick	Brewer, Tomlinson & Brewer,	Chillicothe	7,683.00
Sandusky	Lima-Sandusky	2.16	W. B. Macadam	Thomas Construction Co.,	Sandusky	22,336.95
Scioto	Ohio River	0.97	Brick	S. Monroe & Son Co.,	Portsmouth	21,800.00
Vinton	McArthur-Gallipolis	1.77	Brick	Kuhner & King,	Jackson	19,365.25
	Alternate	1.77	Concrete	Kuhner & King,	Jackson	17,443.80
	McArthur-Logan	(c)	....	Kuhner & King,	Jackson	1,962.00
Warren	Dayton-Lebanon	2.48	W. B. Macadam	John K. Spencer,	Oregonia	4,950.00
Total		45.88				$509,531.50

(a) 30-ft. concrete arch bridge. (b) Bridges, culverts and grading. (c) Wooden superstructure for bridge.

Proposed Issue of Road Bonds to Offset Cotton Crop Failure

A movement has been started in Jones County, Miss., to issue $1,000,000 worth of bonds, the proceeds of which would be used for the construction of a complete county system of highways.

The cotton crop in Jones County was almost a total failure, owing to excessive rains in July and the bond issue is being urged at this time for the special purpose of giving remunerative employment to farmers to offset in a measure their crop losses.

A road bond issue of $300,000 has already been voted in Beat 2 of Jones County and the plan under consideration contemplates issues aggregating $700,000 by the four other beats.

Engineers Wanted for Departmental Work in Philadelphia, Pennsylvania

Some difficulty has been experienced in securing the services of engineers in the various departments of the Philadelphia, Pa., municipal service. The positions pay from $900 to $2,500 a year.

In order to meet the situation, the regulation requiring residence in Philadelphia for two years prior to appointment has been temporarily suspended by the Civil Service Commission. Employment in the positions continues from one to two years, although there are a number of permanent positions.

Kentucky Road System May Be Completed in About Six Years

The second biennial report of the State Commissioner of Public Roads of Kentucky states that at the present rate of progress, it is possible that the inter-county seat and state line system of main highways may be completed in about six years. The system includes approximately 6,400 miles and the estimated time of construction covers a period of about ten years.

During the time covered by the report, from November, 1913, to December, 1915, it is stated that 1,056 miles of roads were surveyed for construction. This mileage includes 259 miles of macadam, 471 miles of macadam reconstruction, 175 miles of earth roads, 77 miles of gravel, 22 miles of brick, 26 miles if bituminous macadam and concrete and 22 miles of concrete. The cost was $2,057,162.06.

Will Make Automobile Tour to Promote Interest in Good Roads

An automobile tour will start from Washington, D. C., on August 28 and will cover a distance of approximately 25,000 miles, the itinerary including a visit to the capital of every state in the union.

The object of the tour is to promote interest in improved roads and capital-to-capital highways throughout the country. A study will be made of road conditions and reports will be submitted to the governors of the states, detailing conditions encountered.

Sprinkler and Drag Being Used on Roads in Utah County, Utah

The County Commissioners of Utah County, Utah, are using a sprinkler followed by a drag on the roads of the county and the combination is proving so successful, according to reports, that it is likely to be adopted by other counties in the state.

Recently members of the Utah State Highway Commission made a tour of the roads of several counties including Utah County, where the sprinkler and drag plan met with their unqualified approval.

The roads are first sprinkled until thoroughly wet and are then dragged. The result is a smooth crust which retains the moisture and lays the dust. The cost of the combined sprinkling and dragging averages 26 cts. per mile, per day.

GOOD ROADS

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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Fresno County, California, to Vote on Big Bond Issue for Roads

The Board of Supervisors of Fresno County, Cal., has called a special election for October 24, when the question of issuing bonds to the amount of $3,600,000 for a system of roads will be submitted to the voters.

It is proposed to construct approximately 325 miles of highways throughout the county. The plan has the approval of the County Highway Commission and has been endorsed by various civic organizations which are conducting an active campaign in support of the proposed bond issue.

Duluth, Minnesota, Planning Extensive Street Work for Next Year

According to a partial list compiled by James A. Farrell, Public Works Commissioner of Duluth, Minn., at least 15 large paving contracts will be awarded during 1917 and work will be completed which will bring total expenditures up to $500,000.

Some of the work contemplated has already been authorized by the City Council. Commissioner Farrell stated that the list as compiled contains only about half of the paving petitions now before his department and that additions will be made later.

Considerable Road Work Under Way in Cambria County, Pennsylvania

The County Commissioners of Cambria County, Pa., have considerable road work under way and nearing completion, including the first brick road built by the county. This is a two-mile stretch from Ebensburg to Carney's Hill, the contract for which was awarded recently. The completed road will be four miles long, but the remaining two miles will not be built until next year.

A five-mile road connecting the state highway with Monday's Corner is being completed by the State Highway Department, the county paying one-fourth of the cost. The department will readvertise for bids on a six-mile brick road from Johnstown to Monday's Corner.

The county has recently completed a mile of brick road out of Cresson and has awarded contracts for considerable road oiling. A program of road construction has been outlined which will carry the county through the next four years.

Wheel Tax for Maintenance of Streets in Minneapolis, Minnesota

A movement for a wheel tax to be applied to street maintenance is being considered by the City Council of Minneapolis, Minn. The proposed ordinance would apply to the city and to Hennepin County, of which Minneapolis is the county seat.

The measure as proposed, contemplates a sliding scale of license fees for all vehicles using the streets, the fees being as follows: Motorcycles and horse-drawn vehicles, $2 a year; motor vehicles, 40 cts. per horse power; two to five-ton trucks, $5 additional; five to seven and a half-ton trucks, $10 additional; over seven and a half-ton trucks, $25 additional.

It is stated by those favoring the measure that approximately $100,000 a year would be raised by this means. Of this amount, $90,000 would go to the city and the remainder to the county.

Bids for Nearly 70 Miles of Road Work Received by New York State

State aid highway work involving the construction of 69.49 miles of roads will be done by the New York State Commission of Highways as a result of bids received recently. The total amount of the low bids was $1,063,837.83.

The work is located in 21 counties. Bids were called for on 97.70 miles of roads, but no proposals were received on a total of 28.21 miles located in seven counties. The names of the low bidders and the amounts of their bids are given below:

County	Mileage	Low Bidder	Amount of Bid
Broome	5.35	No bids received	......
Cattaraugus..	2.17	William F. Felton, Buffalo	$34,159.65
Chautauqua..	0.74	John Johnson Constr. Co., Buffalo	36,320.50
	3.70	No bids received	......
Delaware....	4.31	Brady-Oltarsh C. Co., Johnstown	70,380.50
Erie	3.75	Cold Spring Constr. Co., Buffalo	32,752.25
	4.50	No bids received	......
	5.19	Frank L. Cohen, Buffalo	106,927.00
Franklin	10.36	W. T. Thayer & Co., Chateaugay	124,417.40
Fulton	3.74	No bids received	......
Montgomery.	2.70	No bids received	......
Nassau	3.38	Joseph Capek, Inc., Astoria	44,007.00
Ontario	0.82	F. A. Bushley, Norwich	11,972.50
Otsego	8.13	Newport Constr. Co., Herkimer	88,649.50
Rensselaer...	6.34	No bids received	......
St. Lawrence.	9.12	Mecca Constr. Co., Morristown	144,830.28
Saratoga*...	1.10	John B. Dower, Ballston Spa	70,480.00
Schoharie....	2.73	Lane Const. Corp., Meriden, Conn.	33,838.00
Seneca	2.13	H. A. Schaupp, Guilderland	25,172.35
	2.63	Dale Engineering Co., Utica	27,394.25
Tompkins....	0.43	Patrick D. Conley, Ithaca	5,615.50
	0.61	Patrick D. Conley, Ithaca	16,777.05
Ulster	3.17	George H. McEvoy, Creek Locks	41,271.90
Washington..	6.98	Gifford Constr. Co., Jamaica	98,217.00
Wayne	1.88	No bids received	......
Westchester..	1.74	Summit Eng. & Con. Co., New York	50,555.20
Total......	97.70		$1,063,837.83

*South Glens Falls Village.

J. C. Travilla Reports on Road Work in St. Louis County, Missouri

The County Court of St. Louis County, Mo., has received a final report from James C. Travilla, formerly Street Commissioner of St. Louis, Mo., who was retained by the county as Superintendent Engineer of the road work to be done under a $3,000,000 bond issue. He was subsequently forced to relinquish the position because the Supreme Court ruled that the county could not engage an engineer at a higher salary than $100 a month. Mr. Travilla was retained at $400 a month.

The report includes maps showing Mr. Travilla's plan for a system of trunk lines through the county to connect with main city streets and a further system of five loops with an aggregate length of 184.75 miles.

Of the $3,000,000 bond issue, the report states that $2,790,000 would be required for actual road work. Engineering expenses would require 5 per cent. of the issue and rights of way, bridge widening and incidentals, 2 per cent., or a total of $210,000.

COMING MEETINGS

August 29-31—League of Cities of Third Class in Pennsylvania.—Annual convention, Johnstown, Pa. Secretary, F. H. Gates, Wilkes-Barre, Pa.

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 14-15—New York State Association of County Superintendents of Highways—Meeting, Syracuse, N. Y. Chairman, Executive Committee, George S. Tibbits, Oneida, N. Y.

September 14-16.—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

September 26-28—League of Virginia Municipalities—Annual meeting, Clifton Forge, Va. Secretary, Luther C. Brinson, Portsmouth, Va.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Good Roads Convention in Kansas

A state-wide meeting in the interest of good roads will be held at Topeka, Kan., on September 13, in conjunction with the Big Free Fair which is to be held from September 11 to 18 inclusive. The call for the meeting is issued by Governor Capper.

The sessions will be held at the Topeka Commercial Club and will be presided over by W. S. Gearhart, Kansas State Highway Engineer, and H. S. Putney, President, Kaw Valley Improved Highways Association. A program containing the names of well-known speakers on good roads topics is in course of preparation and an exhibit of road machinery and materials is being planned.

County Highway Superintendents of New York

There will be a meeting of the New York State Association of County Superintendents of Highways at Syracuse, N. Y., on Wednesday and Thursday, September 14 and 15, as noted above.

The meeting will be held in the Onondaga County Court House and the sessions will open at 9.15 a. m. Various subjects concerning the road work of New York State will be discussed.

MEETINGS

County Commissioners of Western Florida Meet

A conference of county commissioners of Western Florida and members of the Florida State Road Department was held August 10 at Marianna, Fla., following an executive session of the State Road Department held on the evening of August 9.

The program included the following papers and speakers: "Good Roads as an Investment," J. D. Smith, Secretary, State Road Department; "Convicts for Public Road Construction and Maintenance," F. O. Miller, State Road Department; "A State Maintenance System, a County Maintenance System and Cooperation Between the Two," William F. Cocke, State Road Commissioner.

Addresses were also made by W. A. McRae, State Commissioner of Agriculture, and M. M. Smith, Capt. W. J. Hillman and Ed. Scott, members of the State Road Department.

Texas Good Roads Convention

A three-day's good roads convention was held at San Antonio, Tex., on August 17, 18 and 19, with an attendance of about 800 delegates representing the Texas Good Roads Association, the Meridian Highway Association and other organizations. Howard Bland, President of the Texas Good Roads Association, presided.

Papers on road building and maintenance were read by a number of authorities on the various topics. D. E. Colp of San Antonio, Secretary-Treasurer, in his annual report stated that Texas has approximately 20,000 miles of improved roads costing about $80,000,000.

The convention adopted resolutions urging the Legislature to create a state highway department and to enact laws requiring provisions for road maintenance on the part of the counties and the elimination of the narrow wagon tire.

The only organization represented at the convention which elected officers was the Meridian Highway Association, which chose D. E. Colp for president. Other elections were deferred owing to press of other matters.

PERSONAL NOTES

C. E. Coles has been appointed State Road Superintendent for Westmoreland County, Pa.

C. E. Harris, City Engineer of Norwich, N. Y., has resigned to enter private practice.

R. H. Tumy has been appointed County Engineer of Mahaska County, Ia., with headquarters at Oskaloosa.

Nial Rook has been appointed State Road Engineer for Indiana County, Pa., succeeding C. H. Harrison, resigned.

A. B. Oyler has been appointed State Road Superintendent in Fayette County, Pa., vice E. L. Clemmer, resigned.

Charles M. Edwards, Resident Engineer of the New York State Commission of Highways at Buffalo, N. Y., has been appointed a division engineer.

E. F. Musson, M. Am. Soc. C. E., has been appointed City Engineer of Norwich, N. Y., succeeding C. E. Harris, whose resignation is noted elsewhere in this column.

Nathan C. Wyeth, an architect of Washington, D. C., has been designated by the Secretary of War to assist the United States Army engineers in the design of a $1,250,000 bridge across the Potomac River.

GOOD ROADS

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The Element of Safety in the Construction and Improvement of Roads

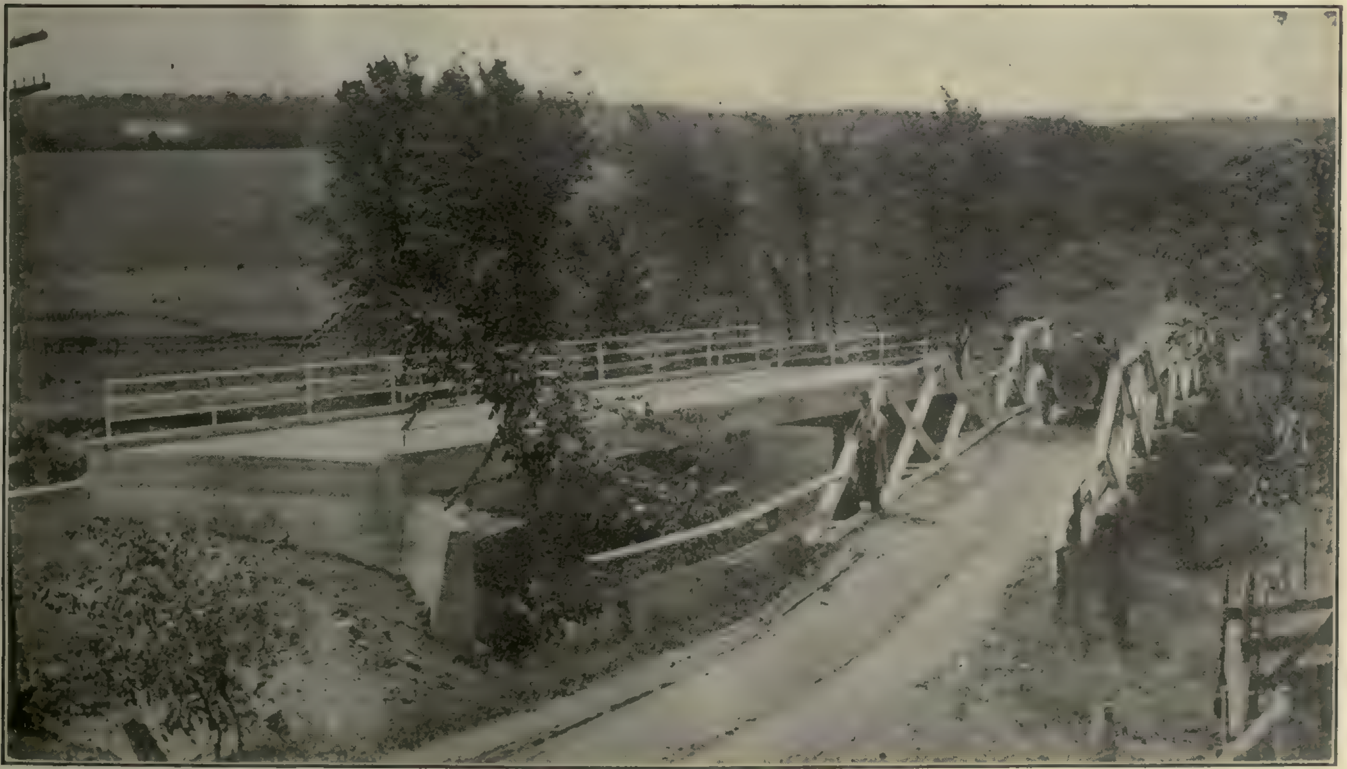
At a time well within the memory of most road builders the element of safety commanded relatively little attention in road work. Neither in design nor in construction was a safe road kept in mind as the kind to be built, and little effort was made to eliminate danger points in existing roads.

The road builders of that time were not greatly at fault in their disregard of this factor in location and construction. The traffic over the roads was light; it consisted entirely of horse-drawn vehicles and pedestrians with an occasional horseback rider, and all of it, according to present standards at least, was slow moving traffic. Accidents, though not unknown, were infrequent, and generally resulted from a road surface out of repair or, often, from some cause not related to the character or condition of the highway. These traffic conditions were the ones for which roads had to be built, and as first cost was often—perhaps more often than now—the governing factor, sharp turns and excessive grades were the rule almost everywhere except in flat or rolling country.

As the automobile evolved from a curiosity to an everyday business and pleasure vehicle, from a clumsy, slow-going "horseless carriage" to a trim, powerful machine capable of express-train speed, the danger of obstructions to the view of the road ahead became more and more apparent. At present motor-driven vehicles are in the great majority on many country roads. They are driven at high speeds and in some sections where the roads carry an especially large number of pleasure cars, every pleasant Sunday or holiday exacts its toll of accidents.

It is doubtless a fact that most automobile accidents are caused by incompetent or reckless driving, but at the same time, dangerous roads are partially responsible. Many an accident would have been prevented in spite of poor or reckless driving had proper provisions been made for safety when the road was built. To put it in another way, it is now necessary to build roads as nearly "fool proof" as conditions and funds permit.

The most common dangers of the road are excessive grades, sharp curves, short sight lines and various combinations of these. The steep grade is perhaps the least dangerous, although it is something to be avoided for safety's sake



THE ELIMINATION OF A DANGEROUS CURVE AND A NARROW BRIDGE ON A NEW YORK STATE ROAD BY THE RELOCATION OF THE HIGHWAY AND THE BUILDING OF A NEW BRIDGE.

as well as for the saving in power. There is occasionally a road upon which the summit of two intersecting grades is a source of danger because the drivers of two cars which happen to meet just at the top can not see each other until just before they meet. Heavy grades are also dangerous because they increase the likelihood of serious results from unavoidable accidents to cars.

The sharp curve is ordinarily dangerous only to vehicles on the wrong side of the road or traveling at a comparatively high speed. But it is necessary to recognize that motor vehicles will be driven at fairly high speed and that the drivers will often take a chance and hug the inside of a curve whether the inside is to the right or to the left. At a curve there is added to the danger of collision that of leaving the road if the car is speeded beyond a certain limit.

Short sight lines are without doubt the greatest of the three dangers to which reference has been made. A sight line shortened by obstructions is most frequently encountered on curves, but is also common at intersections where, as a matter of fact, three sight lines have to be taken into account—one along the road ahead, and one each way along the intersecting road or railway. Assuming a roadway to be of sufficient width to allow two vehicles to pass safely, an obstructed view of the road ahead—like the sharp curve—would not be a menace to the safety of motorists or other users of the road if all drivers kept to the right and drove slowly enough so that they could stop within a very short distance. These conditions do not obtain, however, and it is necessary to consider the sight line very carefully.

BRIDGE AT "HAIRPIN" TURN ON THE ROAD BETWEEN LITCHFIELD AND NEW MILFORD, CONN.—BEFORE IMPROVEMENT.

The work of providing for the safety of traffic may be considered under two general classifications, first, in the design and construction of new roads, and second, in the relocation and reconstruction of existing roads.

In new work, the making of ample provisions for safety is very largely a matter of location. Grade, curvature, and, to a considerable extent, the sight line, generally can be adjusted to the requirements of safety when laying out the route, although special construction may sometimes have to be provided for when the location is fixed by topographical conditions or by the difficulty of securing rights of way. Probably no hard and fast rules can be laid down for limiting grade and curvature—both having to be determined with reference to the conditions obtaining on the particular road under consideration.

The grade will often be determined very largely by the available funds, and, of course, where a steep grade is unavoidable, especial effort should be made to avoid sharp turns and obstructions to view on the inside of the curves. The steep grade, in itself, is less dangerous than the sharp curve, and both are rendered safe if a sufficiently long sight line is provided.

Minimum radius of curve, like maximum grade, must be determined with care, but, again like the matter of grade, it cannot be made the subject of a fixed rule. It must be decided upon in each case, giving due weight to grade, sight line, and a variety of other factors, both independent and inter-dependent.

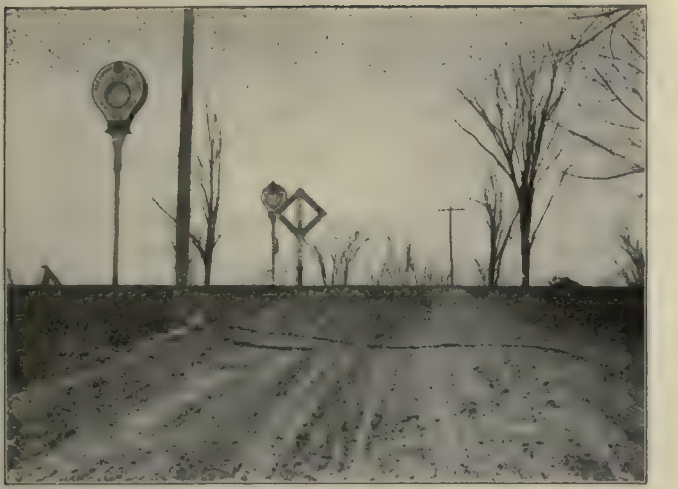
The sight line is by far the most important factor entering into the problem of building safe roads, for it can be made the most fruitful cause of accidents or the most effective safeguard. As indicated in the previous references to grade and curvature, what would otherwise be dangerously high grades and sharp curves can be made safe by providing a sufficiently long sight line. The problem of determining the necessary length of sight line is similar to that of fixing upon a maximum grade or that of finding the minimum radius of curvature in that it cannot be considered alone, but must be studied in connection with other factors, chief among them being grade and curvature. Indeed, these factors are so inherently inter-dependent that no intelligent discussion of any one of them can be undertaken unless the other two are assumed.

In the location of a new road the route should be carefully examined throughout its length with a view to so adjusting grade, alignment and sight line as to make the road safe for the traffic it will carry. Upon occasion reliance will have to be placed almost solely upon sight lines to accomplish the desired resut, and there will be but few cases in which a long sight line will not provide an adequate safeguard.

BRIDGE ON LITCHFIELD-NEW MILFORD ROUTE REPLACING STRUCTURE SHOWN IN ILLUSTRATION AT LEFT.

It is most frequently in the work of improving existing roads, however, that the problem of providing for safety becomes pressing, for the great bulk of highway work at present consists of improving old roads rather than building new ones. For the reasons already outlined, many of the present roads were built with little or no regard to the now important consideration of safety and the frequency and seriousness of accidents make it essential to remedy the conditions that are contributing causes. Such remedial measures consist largely of widening roads at curves, banking curves sharp enough to require it, reducing grades where practicable, and removing obstructions in the sight line. These measures are, of course, the same as those taken in original construction, and, in general, are carried out in the same way.

Widening the road on curves is one of the simplest of safety provisions, and has become standard practice in many sections both in new work and improvement. How much should be added to the width of a road at a given curve naturally depends largely upon local conditions. Both the paved portion and the outer shoulder should be widened, the



ORDINARY WARNING SIGN SUPPLEMENTED BY NIGHT SIGNALS ON A NEW YORK ROAD.

latter to provide an added safeguard if a vehicle is forced off the pavement. Sometimes additional right of way has to be secured in order to widen the road, but even in such cases, the expenditure generally would be justified. An advantage of such construction at curves, apart from the greater safety secured, is that there is a tendency toward a better distribution of traffic over the width of the pavement.

Another method of safeguarding traffic at curves is the division of the road into two parts. This divides the traffic, as on such a curve only the most flagrant disregard of the rule of the road would make it possible for a driver to hug the inside when keeping to the right would necessitate taking the outside of the curve. Where this construction is used the width of each separate pavement should be somewhat greater than half the width of the pavement on tangents, unless the latter has a width exceeding about 20 ft. This design has been used to some extent in Minnesota state work.

Curves on roads used to any considerable extent by motor-driven pleasure vehicles should be banked. The amount of superelevation will depend on the degree of curve and the speed of traffic, but it should never be great enough to be a serious hindrance to slow traffic or to standing vehicles. There is, however, one objection to the banked curve; it probably tempts the driver of an automobile to a speed greater than is safe.

Reduction of grade is so generally undertaken for other reasons than safety that it needs little consideration. It is safe to assume that grades will be cut down about as much as possible, or practicable, to reduce the resistance to travel and that the matter will rarely come up merely as a safety measure.

A DANGEROUS CURVE ON A CONNECTICUT ROAD—A NEW LOCATION WAS MADE HERE.

Lengthening the sight line is doubtless the measure most generally adopted to remedy unsafe conditions. It is not only the most effective, but frequently is the only practicable expedient. The necessary length of sight line can no more be determined by a rule-of-thumb than can the other problems of safeguarding travel. But a sufficiently safe road will be provided if the sight line is made approximately equal to twice the distance in which it is possible to bring to a stop, without undue strain on the brakes or upon the skill of the driver, a car traveling at the greatest speed likely to be attained at the place under consideration. Fixing upon this speed may be a matter of some difficulty, since speed maniacs are everywhere, and an attempt to guard traffic from these exceptional cases would bring the cost to a prohibitive amount. It is sufficient to assume a maximum speed of, say 40 or 45 miles an hour, which would cover all ordinary traffic and most of the cases of excessive speed since the meeting of two cars each going over 40 miles an hour at any particular curve would be infrequent.

The actual work of lengthening the sight line generally consists of either excavating the bank on the inside of the curve, or clearing the corresponding area of trees, underbrush or other obstructions. On country roads this usually can be done at a comparatively small cost. Where it would be necessary to excavate rock, the cost would generally be prohibitive, as it might also if lengthening the sight line necessitated cutting valuable timber. In such instances recourse can often be had to widening the road on the outside of the curve, for as a rule extra right of way can be secured on one side or the other. If the road runs through a rock cut or for some other reason is so located as to make securing additional width unduly expensive, reliance must be placed upon warning signs.

APPROACH TO THE "DEATH TRAP" AT WINDSOR, CONN.—NOW BEING IMPROVED.

In actual work more and more attention is being paid to the matter of safety. In New York state work, for instance, the pavement proper is widened on curves and banked. In addition, the slopes of the inner banks at curves are cut back and cleared far enough back to materially lengthen the sight line. The standards of the New York Commission of Highways provide for banking a 16-ft. pavement as follows Curves up to 300 ft. radius, 10 ins.; 300 to 400 ft. radius, 9 ins.; 400 to 550 ft. radius, 8 ins.; 550 to 800 ft. radius, 7 ins.; 800 to 2,000 ft. radius, 6 ins. Where curves are banked in this manner, the road surface is made a plane intersecting the plane of the theoretical grade at the center line of the pavement.

Two of the accompanying illustrations show safety work done by the New York State Highway Department. In the illustration of the grade crossing, the ordinary warning sign erected by the railroad is visible at the left beyond the track. In addition there are two night signals installed by the department. The other illustration shows the elimination of a very bad curve and a narrow bridge by the relocation of the highway and the construction of a concrete slab bridge.

Examples of work done by the Connecticut State Highway Department to make the roads safer are shown in four of the accompanying illustrations. In one illustration on page 109 is shown the approach to a dangerous curve that formerly existed on the Hartford-Saybrook Turnpike. The left-hand curve was followed by another to the right. The view ahead on the curve illustrated was obstructed by the barn, and another building shut off the view on the other curve. This condition was eliminated by a relocation that gave a practically straight road.

The two illustrations on page 108 are reproductions of photographs taken at a point formerly called "Hairpin Turn" on the trunk line highway between Litchfield and New Milford, the one on the left being made before, and the one on the right after, the improvement of the road. The old bridge shown in the left-hand illustration, besides being inadequate in itself, was approached on either side by a sharp pitch. In the right-hand illustration is shown the method adopted for eliminating this danger point.

An illustration on page 109 shows the approach from the south to the so-called "Death Trap" at Windsor. In this case the highway and the trolley track at the side descend a steep hill and turn to the right under the railroad, then turn sharply and cross the Farmington River on an old covered bridge. This section of road is at present being improved and when completed the underpass will be eliminated, a new steel bridge will be built across the river, and the curvature will be materially reduced.

Similar methods are followed in most of the states where a portion of the road work is performed under the supervision of highway departments and also, of course, in work done under the road authorities of smaller units.

The Effects of Materials and Methods of Preparation on the Properties of Concretes[*]

1. No standard of compressive strength can be assumed or guaranteed for concrete of any particular proportions made with any aggregate unless all the factors entering into its fabrication are controlled.

2. A concrete having a desired compressive strength is not necessarily guaranteed by a specification requiring only the use of certain types of materials in stated proportions. Only a fractional part of the desired strength may be obtained unless other factors are controlled.

3. The compressive strength of a concrete is just as much dependent upon other factors, such as careful workmanship and the use of the proper quantity of water in mixing the concrete, as it is upon the use of the proper quantity of cement.

4. The compressive strength of concrete may be reduced by the use of an excess of water in mixing to a fractional part of that which it should attain with the same materials. Too much emphasis can not be placed upon the injurious effect of the use of excessive quantities of water in mixing concrete.

5. The compressive strength of concrete may be greatly reduced if, after fabrication, it is exposed to the sun and wind or in any relatively dry atmosphere in which it loses its moisture rapidly, even though suitable materials were used and proper methods of fabrication employed.

6. The relative compressive strength of concretes to be obtained from any given materials can be determined only by an actual test of those materials combined in a concrete.

7. Contrary to general practice and opinion, the relative value of several fine aggregates to be used in concrete can not be determined by testing them in mortar mixtures. They must be tested in the combined state with the coarse aggregate.

8. Contrary to general practice and opinion, the relative value of several coarse aggregates to be used in concrete can not be determined by testing them with a given sand in one arbitrarily selected proportion. They should be tested in such combination with the fine aggregate as will give maximum density, assuming the same ratio of cement to total combined aggregate in all cases.

9. No type of aggregate such as granite, gravel, or limestone can be said to be generally superior to all other types. There are good and poor aggregates of each type.

10. By proper attention to methods of fabrication and curing, aggregates which appear inferior and may be available at the site of the work may give as high compressive strength in concrete as the best selected materials brought from a distance, when the latter are carelessly or improperly used.

11. Density is a good measure of the relative compressive strength of several different mixtures of the same aggregates with the same proportion of cement to total aggregates. The mixture having the highest density need not necessarily have the maximum strength, but it will have a relatively high strength.

12. Two concretes having the same density but composed of different aggregates may have widely different compressive strength.

13. There is no definite relation between the gradation of the aggregates and the compressive strength of the concrete, which is applicable to any considerable number of different aggregates.

14. The gradation curve for maximum compressive strength, which is usually the same as for the maximum density, differs for each aggregate.

15. With the relative volumes of fine and coarse aggregate fixed, the compressive strength of a concrete increases directly, but not in a proportionate ratio as the cement content. An increase in the ratio of cement to total fine and coarse aggregates when the relative proportions of the latter are not fixed does not necessarily result in an increase in strength, but may give even a lower strength.

16. The compressive strength of concrete composed of given materials, combined in definte proportions and fabricated and exposed under given conditions can be determined only by testing the concrete actually prepared and treated in the prescribed manner.

17. The results included in this paper would indicate that the compressive strength of most concretes, as commercially made, can be increased 25 to 100 per cent. or more by employing rigid inspection which will insure proper methods of fabrication of the materials.

The Concrete Floor of the Popolopen Steel Arch Bridge is being used as a pavement at present, though it will eventually be covered with an asphaltic wearing surface. This course has been adopted because it is believed that the asphaltic surfacing will adhere to the concrete better after the latter has been subjected to some months' wear. The bridge which was recently completed and opened to traffic is over Popolopen Creek, some five miles to the south of West Point, N. Y. The piers were built by the New York Commission of Highways while the superstructure was erected with funds furnished by the Palisades Interstate Park Commission. The opening of the bridge provides the last link in a good automobile road from the mouth of the Hudson to West Point.

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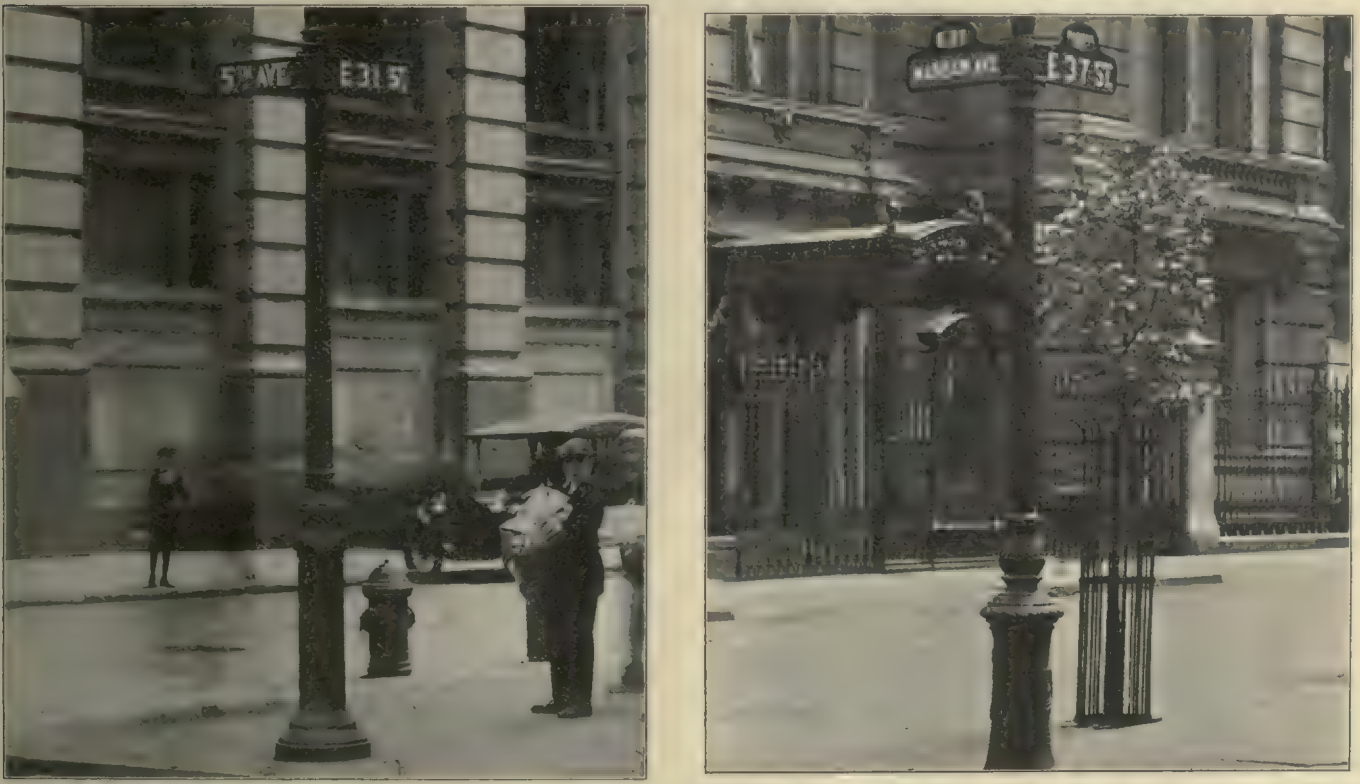
[*] Conclusions from Technologic Paper No. 58 of the Bureau of Standards, U. S. Department of Commerce, entitled, "Strength and Other Properties of Concretes as Affected by Materials and Methods of Preparation," by R. J. Wig, Engineer Physicist, G. M. Williams, Assistant Engineer Physicist, and E. R. Gates, Assistant Physicist, of the Bureau of Standards, U. S. Department of Commerce.

Street Work in Manhattan Borough, New York City, Reviewed by President Marks

About forty miles of pavement should be renewed annually during the next ten years in the Borough of Manhattan, and thereafter about thirty miles should be put down each year, according to the annual report of Borough President Marcus M. Marks of the Borough of Manhattan, New York City, for the year ending December 31, 1915, which has just been made public. The cost of this work is placed at about $3,000,000 a year for the first 10 years and about $2,225,000 a year thereafter.



Type of Sign Formerly Used—Each Arm Carries the Name of Only One Street.

New Type Rapidly Replacing Type Shown at Left—Both Street Names on Each Arm.

OLD AND NEW TYPES OF STREET SIGNS USED IN MANHATTAN BOROUGH, NEW YORK CITY.

The estimated mileage to be laid annually is based upon the assumption that the average useful life of the street pavement in the city, of which there is about 456 miles, is about 15 years. This, it is stated, necessitates the annual reconstruction of about 30 miles, but because present conditions are not normal, the increased annual mileage is recommended for the first 10 years. The extra 10 miles is provided to take care of the large present mileage of pavement of poor type and of improper construction.

Traffic density and subway construction are cited as the causes for the magnitude of Manhattan's paving problem. The pavements in sections along the line of subway construction have been taken under the control of the Public Service Commission, and according to the report this division of authority over the pavements of the city results in confusion and misunderstanding. It is pointed out that the Bureau of Highways is powerless to relieve the situation until control of the pavements on streets in which subway construction is going on is turned back to the Borough President. The appropriations since 1913 for repaving, according to the report, have been insufficient. The 1914 appropriation was $1,000,000, the 1915 appropriation $600,000, and the 1916 appropriation $1,400,000. These, it is stated, have been entirely inadequate, and serious deterioration must result. The street traffic in the city is extremely heavy, the heaviest vehicular traffic in any place in the world being at the intersection of Fifth Avenue and 42nd Street, according to a count made by the borough authorities. The record figure for one hour was 1,149 vehicles in one direction. The corresponding figures for London and Paris were 900 on the Strand and 600 on the Boulevard des Capucines.

The life of the pavements is materially shortened by the enormous number of openings which are made to permit work on subsurface structures. During 1915, 22,000 such openings were made in Manhattan. This necessitated the replacing of 132,000 sq. yds. of pavement.

One of the most important streets paved during 1915 was that portion of 32nd Street between Fifth Avenue and Broadway. This carries a very heavy traffic, part of it being due to the travel between Fifth Avenue and the Pennsylvania Terminal. On this account it was necessary to expedite the paving as much as possible and a contract was made calling for a working day of 16 hours. The contract was completed in 18 days, during which time the street was closed to traffic for only 8 days. The results of this experiment, according to the report, were so gratifying that it is proposed to require night and day work in the future whenever traffic conditions demand it.

Increased use of improved granite block pavement is reported. This type is used, according to President Marks, because of its durability and the ease and cheapness of replacing it after openings for subsurface work.

Among other points mentioned in the report are the successful operation of the borough asphalt plant, the preparation of plans for repaving the Riverside Drive viaduct and the 155th Street viaduct, the adoption of a plan for the Park Avenue and 34th Street grade improvement, the removal of sidewalk encroachments and encumbrances, and the installation of street signs.

The plans for the Park Avenue and 34th Street improvement call for a ramp on the east side of Park Avenue between 32nd and 34th Streets, and the intersection of 33rd Street and Park Avenue at grade.

The new type of street signs devised in 1914, which show the names of both streets on each side, was continued during the year. By adapting the signs to the frames which were used for the old signs at least $6,500 was saved, according to the report, this saving making possible the installation of signs at 1,317 more corners than could have been provided for otherwise. During the year 38,039 street signs were removed, cleaned, repaired, painted and restored. In addition, school, hospital, traffic and paving signs were erected at various points.

Allotment of Federal Funds for National Forest Roads

According to a recent announcement of the Forest Service of the United States Department of Agriculture, Secretary of Agriculture Houston has made tentative allotment of $1,000,000 of federal funds for expenditure on roads in national forests.

This allotment is made under the provisions of a section of the so-called Shackleford-Bankhead federal aid bill which recently became a law. The section referred to carries an appropriation of $10,000,000 to be expended in ten years. The present allotment is made from the funds to be expended during the fiscal year ending June 30, 1917. According to the law, the funds are to be expended under the supervision of the Secretary of Agriculture upon request of the proper officers of the states, territories or counties in which national forests are situated. It is provided that the local units must enter into cooperative agreements with the Secretary of Agriculture "for the survey, construction and maintenance of such roads or trails upon a basis equitable to both the state, territory or county, and the United States." And it is also provided that the expenditure in any state, territory or county, shall not exceed 10 per cent. of the value of the timber and forage resources which are or will be available for income upon the national forest lands within the county or counties in which roads or trails will be constructed, this value to be determined by the Secretary of Agriculture.

The tentative allotments to the principal national forest states are as follows: Alaska, $46,280; Arizona, $59,795; Arkansas, $11,294; California, $140,763; Colorado, $62,335; Idaho, $108,010; Montana, $69,901; Nevada, $19,195; New Mexico, $42,622; Oregon, $127,794; South Dakota, $8,115; Utah, $40,982; Washington, $91,739; Wyoming, $40,566. In addition to this, there has been tentatively assigned to the States of Florida, Michigan, Minnesota, Nebraska, North Dakota and Oklahoma a total of $9,552, while the States of Maine, New Hampshire, Virginia, West Virginia, North Carolina, South Carolina, Tennessee and Georgia, in which the government is purchasing lands for national forests, receive a total of $21,057.

According to Secretary Houston, 10 per cent. of the amount available each year will be withheld as a contingent fund. One-half of the remaining 90 per cent. will be allotted to the states in amounts based on the area of national forest lands in each state, and the other half will be apportioned on the basis of the estimated value of timber and forage resources contained in the forests. "In general," according to Secretary Houston, "the states and counties will be required to furnish cooperation in an amount at least equal to 50 per cent. of the estimated cost of the surveys and construction. However, upon a satisfactory showing by the applicant state or county that such proportion of cooperation is inequitable, it may be altered and the ratio of cooperation fixed upon a basis equitable to both the state or county and the United States." Apportionments made after the close of the present fiscal year will be made giving consideration to the applications by local officials for expenditures on specific projects. Such applications, it is stated, must be filed with the district foresters in the seven national forest districts by January 1 of each year, for the fiscal year commencing the following July 1.

The basis of determining projects upon which expenditures will be made during the current fiscal year will be the applications filed with the district foresters on or before October 1, 1916. Each of these applications must contain a statement showing in what manner and to what extent the improvement would aid in the development of resources upon which communities within or adjacent to the national forests are dependent, and must also show the general location of the proposed road and contain an estimate of its cost.

The groups of states to which lump sum allotments are made are to be considered as single units of apportionment.

Signs Over Sidewalks in Philadelphia, Pennsylvania*

The uglification of sidewalks, especially those downtown, through the erection of overhanging signs, both lighted and unlighted, and the multiplication of other nuisances, such as marquises, metal awnings and private bridges, calls for the serious consideration and decisive action of the public authorities. Steps should be taken at once to end the further erection of most of these sources of ugliness and to eliminate those already put up. We are glad to report that the Art Jury has made the following comments on overhead signs:

> Each sign represents a cost, which, compared with the cost of other undertakings passed upon by the jury, is practically negligible, yet the debasing of public taste resulting from the erection of these signs is perhaps greater than that resulting from any other cause. The Jury therefore here repeats its recommendation concerning this matter. * * *
>
> "The Art Jury has carefully considered the subject of overhanging signs, whether illuminated or not, and has investigated the practice in New York, Boston, Washington and the principal foreign cities. The Jury has concluded that the advantages of such signs are greatly overbalanced by their disadvantages. The danger to pedestrians from all signs projecting over the sidewalk is one that cannot be obviated and is in itself a sufficient reason for refusing permission for their erection.
>
> "While illuminated signs add somewhat to the light of the city at night, this additional light is better distributed by signs parallel to the facades of the buildings, to which they can be securely affixed, against the walls. A continuous series of overhanging signs interferes with the light of the street in the daytime and reduces the value of properties fronting on the street because of the unattractiveness in the view along the street overhead. This detriment to the appearance of streets is becoming accentuated, as signs are projected from building after building, not only from the lower but from the upper floors as well, while one sign cuts off the view of others and so diminishes the value of this method of advertising. A continuation of the process will result disastrously to the appearance of the city as a whole and will be an increasingly serious menace to the lives and limbs of the people who use the sidewalks, as the signs become older and their supports rust or become otherwise weakened.
>
> "The Jury therefore recommends to the Chief of the Electrical Bureau and the Department of Public Safety that all further permits for the erection of signs projecting over the sidewalk be refused.
>
> "It further recommends that as soon as possible a general plan shall be devised for the ultimate removal of all such signs already erected and for the future restriction of all private signs to those closely attached to the walls of buildings and parallel therewith."

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*From a section entitled "Sidewalk Uglification" in the 1915 report of the City Parks Association of Philadelphia.

Grade Crossing Accidents[*]

By ALEX GORDON[†]

While the operation of trains in the United States has become safer, so far as passengers and trainmen are concerned, it has become much more hazardous to those who are compelled to cross the tracks. The reasons for this increase are not difficult to find. Before the coming of the automobile, traffic on the highways was carried on by horse-drawn vehicles at a speed which rarely exceeded ten miles per hour and which probably averaged less than five. On account of the limitations of the horse, drivers were generally in territory which was so familiar to them that they knew where each crossing was located, its condition and surroundings, and were often even familiar with the time-tables of the railroads. In the country, because many horses were unused to trains, drivers as a rule desired to be as far away as possible from a crossing when a train passed over it. This has all been changed. The coming of the automobile has vastly increased the mileage of good roads, and the two together have made it possible for much traveling to be done in territory unfamiliar to the traveler, while the speed of traffic on the roads has been very greatly increased.

During this period in which the automobile has been developing, there has developed also a desire on the part of those who work in the cities to live in the suburbs, and this has led to the construction of interurban railroads and the use of high-speed cars upon them, as well as additional high-speed service on the steam railroads. Population in and about the larger cities has also greatly increased during this time and the traffic on both rail and road has been intensified by this growth.

The situation in California is peculiarly unfavorable to satisfactory grade crossing conditions. The state ranks third in the number of its automobiles. It will compare favorably with any state in the mileage of its improved roads. It has a large automobile tourist traffic unfamiliar with its highways, and it has a climate which permits the use of automobiles every day during the year. Its suburban trains, especially in the south, are numerous and run at high speeds, and the topography of the country in the valleys where the population is greatest, train service most frequent and improved highways most numerous, rarely permits of grade separations being made without the expenditure of large sums of money. In these valleys, also, fruit orchards are plentiful and grade crossings are often concealed by the trees at the intersection of the railroads and highways. Bearing this condition in mind, it is not difficult to believe that California, with less than 4 per cent. of the population of the country and less than 2 per cent. of the steam railway mileage, furnishes nearly 5 per cent. of the deaths and injuries reported to the Interstate Commerce Commission as resulting from grade crossing accidents on steam railroads.

During the three years ended June 30, 1915, 249 people were killed and 1,093 injured at grade crossings in this state. During six months ended December 31, 1915, 65 people were killed and 222 were injured; in January there were 2 killed and 24 injured; in February 8 killed and 16 injured, and in March 3 killed and 35 injured; and the record is always much worse in the summer than in the winter.

We are horrified at the waste of human life going on in Europe, but we hardly give a thought to the absolute waste of life which is going on around us unless we happen, in a measure, to be charged with responsibility for it. Crossing accidents result from a very small percentage of the movements which are made over railroad tracks on highways, but we are appalled when we collect these accident statistics and find how large the total is. The Interstate Commerce Commission, the state commissions all over the country, boards of supervisors, city officials, railroad officials themselves and others are carefully investigating the matter and attempting to work out some solution of this grade crossing problem.

An unfortunate feature of the situation is found in the fact that many of these accidents are due to carelessness. The Southern Pacific Company recently made test observations at 34 crossings. They observed over 17,000 motor vehicle drivers and found that 69.5 per cent. looked neither way before crossing the tracks, 2.7 per cent. looked in one direction only, and but 27.8 per cent. looked both ways. Nineteen and three-tenths per cent., or the incredible number of 3,300 drivers, ran over the crossings at a reckless rate of speed. Only 35 drivers, or two-tenths of one per cent., stopped their machines before crossing the tracks. Four thousand and nine hundred drivers of teams were observed, 39.4 per cent. of whom looked in neither direction, 8.6 per cent. looked one way only, and 52 per cent. looked in both directions. Of 6,300 pedestrians observed, 49.1 per cent., or practically one-half of the total, looked neither way, 15 per cent. looked in one direction only, and 35.9 per cent. looked both up and down the track. The same company has tabulated the accidents on grade crossings which have happened during the last five and one-half years in an attempt to secure the reasons for these accidents:

	Killed, Per cent.	Injured, Per cent.
Ignored train and its warning	35.0	37.1
Ignored train and its warning and warning of crossing bell, automatic and human flagman, and warnings of other persons	13.8	12.6
Ran into side of train	10.1	15.3
Stalled on track	7.8	4.2
Tried to beat train to crossing	16.0	9.3
Other causes	17.3	21.5
Total	100.0	100.0

This company during two years had 525 crossing gates broken by vehicles which drove into them while they were down.

In view of these figures the eventual solution of the crossing problem, it is plain, must be grade separation, but this solution is a long way in the future. There are over 10,000 grade crossings in California and $30,000 would be a low estimate of the cost of eliminating one crossing. To separate grades at all of the crossings would cost over $300,000,000 and it is, of course, out of the question to consider any such expenditure at this time. Neither the people nor the railroads can stand it.

As long as the grade crossings must remain we must do what we can to make them as safe as possible.

There are three ways of protecting crossings. The most expensive is that of installing gates with attendants. It costs $700 to install a set of crossing gates, and $900 per year to pay the wages of attendants and the cost of operation. Probably the next best method of protecting crossings is by human flagmen. The railroads have found that it costs them about $600 per year to protect a crossing in this manner. The third type of crossing protection is by automatic bell, wigwag, automatic flagmen or similar device, and while they are not as efficient as the other two types they are much better than no protection at all.

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[*] From a paper entitled "Accidents at Grade Crossings and to Trespassers" presented at the 1916 convention of the County Supervisors of California.

[†] Commissioner, California State Railroad Commission.

These devices cost from $350 to $600 to install and the cost of maintaining them is from $2 to $10 per month. From this it can be seen that even the cheapest sort of protection cannot be installed at once at all the crossings in California—yet something must be done.

Under the provisions of the public utilities act of this state, which went into effect in March, 1912, the Railroad Commission has been made more or less responsible for grade crossing conditions in California. In Section 43-A of the act, the Legislature holds the commission responsible for the safety of future crossings by requiring that its permission shall be obtained before a new crossing can be constructed. In Section 43-B it rests the same responsibility upon it for crossings previously constructed by giving it the power to alter or abolish them or to require grade separations to be made in place of them. The commission fully realizes this responsibility and considers it one of the most important of the many duties it has to perform. It has had all crossing accidents resulting in loss of life investigated and as a result of these investigations many protective devices have been installed. It has repeatedly said in its decisions, and has followed the principle, that no more crossings shall be made unless they are absolutely necessary. Recently it has instituted a state-wide investigation into grade crossing conditions. In March the entire commission held hearings in San Diego, San Francisco, Sacramento, Fresno and Los Angeles to consider the subject and it now has several parties of engineers in various parts of the state engaged in making inspections and reports on grade crossings.

I would like to point out to you a few things you can do to assist the commission in the work it has undertaken—things which will have their influence in bettering the crossing situation in the state.

Most of the crossing applications upon which the commission acts, except spur track crossings, are made by cities, towns or counties to cross main line tracks of railroads. The railroad lines, and especially the main lines and the more important branch lines in California, are located and permanent. As the country settles up, large farming tracts are subdivided into smaller farms and property in and adjacent to the towns and cities is cut up into lots. It has been the experience of the commission that these subdivisions are laid out with but slight reference to the location of railroads within their boundaries, so far as grade crossings are concerned, and the streets and highways which traverse them are later accepted as public highways by the counties almost without question. When property in one holding is laid out on both sides of a railroad track, the streets or highways are located exactly as they would be if the railroad were non-existent, and although few streets are opened across the track when the project is first started, it is the expectation that later all of the various streets will be dedicated to public use and will cross the rails. If future subdivisions were laid out with the realization that all grade crossings will eventually be abolished a large decrease in the number of grade crossings to be made would be effected.

This is a matter in which you can be of great assistance. The commission has, of course, no jurisdiction over the roads the counties accept as public highways, but if the county officials would refuse to accept road dedications which involve, or may, in the future, involve, the construction of crossings in close proximity to each other the number of crossings to be applied for would be lessened.

Another matter is that of closing railroad crossings which are not absolutely necessary. There are many instances in the state where public crossings have been built to serve one or two people who could be served almost as conveniently at some adjacent crossing. There are still other crossings which can be closed without causing inconvenience to anyone if short highways are built to some other crossing where the traffic can cross with more safety.

As was said in the commission's opinion in connection with an application of the city of Santa Cruz to construct a crossing:

> It has been often argued that with a given amount of traffic across the track from one side to the other no additional hazard would be incurred by opening a few additional crossings. To show the fallacy of this argument it is necessary only to consider the case of a city where all the traffic crosses on one street and the same city with the track through it an open highway where vehicles and pedestrians can cross at will. In the first case, by having traffic concentrated at one point, the engine driver can and will use a certain amount of caution when crossing this street, and the users of the crossing will be induced to properly safeguard their own approach. Where the track is open, or where many crossings exist close together, it is impossible for an engine driver to take the same pains to avoid an accident, and the people who cross the track become careless and forgetful of the risk they incur and cross the track many times when it is not necessary to do so.

Here, again, is something which can very well be done by the boards of supervisors. I have said that every crossing carries with it a certain amount of hazard. It also carries with it the promise of future expenditures when all crossings are made at separated grades. When that time comes each crossing then in existence will mean an outlay of from $30,000 to $150,000 and the cost of that work will finally be borne by the people in higher rates even if the original cost is borne by the railroads. It is not only a good safety measure, but it is good business, to keep the number of new crossings down and eliminate now all crossings which are not absolutely needed.

I do not wish to convey the idea that the commission will oppose the construction of any more grade crossings. To develop the resources of the state, good roads, conveniently located for public travel, are needed. We need more of them, and there are going to be grade crossings on some of them but we should remember that conditions are no longer what they used to be when automobiles were unknown and trains ran at speeds of 20 miles per hour, and we should not burden the counties and the railroads with public highway grade crossings by granting crossings, as we used to do, to accommodate everyone who takes the trouble to apply for them.

Meanwhile the existing situation must be met. It has been suggested that the Legislature should pass laws requiring all motor vehicles to come to a full stop before passing over a grade crossing. In the opinion of many such a law would be unreasonble and because it was unreasonable would not be enforced. The city of Long Beach has an ordinance requiring all jitneys to stop before crossing a railroad track and it is reported to be very successful in its operation, but this is a different matter from requiring all motor vehicles to stop at all railroad crossings in the state and the difficulties of enforcing it are much less than they would be in enforcing a similar law that was statewide in its application. To my mind a better suggestion is a law requiring the drivers of motor vehicles to drive slowly when approachng an intersection of a track and a highway. Such a law would not be unreasonable. The law-abiding drivers —and I believe they form a large majority—would be careful to observe it, and those who would not otherwise respect it would be compelled to respect it by the same officers that make them respect the speed limit law.

Personally I have not a great deal of sympathy with the careless driver who gets hurt in a crossing accident. But our figures show that when a driver is hurt or killed three or four people with him are also hurt and killed. Last September may be taken as a typical month. Three auto drivers were killed in the state that month and ten other occupants of the automobiles were killed at the same time.

Nine drivers were injured and 37 other occupants were injured. These other occupants of the vehicles struck by trains were in many cases—possibly in most cases—relatives of the drivers, often wives and children, and if the careless driver when left to himself so far forgets the safety of himself and those who are nearest to him as to jeopardize their lives in this fashion, it is time for the law to step in and tell him what he must do to guard them.

It has been suggested that some state body—the Railroad Commission, for instance—should have the right to place distinctive signs in a conspicuous location at all exceptionally dangerous crossings which would, under the law, require automobile drivers to bring their vehicles to a stop before crossing the track. Such a law, in connection with a law requiring slow speed over all crossings, might have a very helpful effect. The commission is now investigating the subject and will make such recommendations to the next Legislature as the result of these investigations seems to make advisable.

Recommendations for Street Cleaning in New York City

Extensive changes in the methods of conducting the work of street cleaning in the Boroughs of Manhattan, Brooklyn and the Bronx, New York City, are recommended in a report to Commissioner of Street Cleaning John T. Fetherston by Richard T. Fox, which has just been made public. The recommendations are divided into two parts, the first concerning the department as a whole, and the second referring to the installation of the "model district." The report which is noted elsewhere in this issue also contains much matter explaining the recommendations and the reasons for them, which can not be included in the space available here.

The recommendations which concern the department as a whole are as follows:

1. That the administrative control of the department be made continuous by the employment of a trained and competent commissioner and trained and competent deputy commissioners of street cleaning whose tenure of office will be determined by the results obtained in the conduct of the work of the department.

2. That the Commissioner of Street Cleaning be given greater latitude in the expenditure of appropriations.

3. That the cooperation of the Courts and the Departments of Police and Health in the enforcement of the clean street ordinances, of the Dock Department in the provision of adequate dock facilities for waste removal and dumping of snow, of the Bureau of Highways in the construction of streets and repairs to streets, of the Bureau of Buildings in the control of permits to occupy the streets during the construction of buildings, and of the Bureau of Sewers, in the cleaning of catchbasins and sewers, is necessary to economy and efficiency in cleaning the streets and in the collection and removal of city wastes.

4. That the cleaning and flushing of sidewalks for which no one, official or householder, is now responsible, be added to the duties of the Street Cleaning Department.

5. That, although there is a large proportion of competent men in the uniformed force, the personnel is open to much improvement. The quality of work of the sweeping force, particularly, should be bettered, resulting in a higher state of cleanliness at no increase in cost.

6. That the department be kept abreast of the times in the adoption of the improved methods of street cleaning and improved street cleaning equipment.

7. That the block by block survey and analysis and study of conditions, now under way, affecting the quantity of work the individual sweeper or driver or other unit is capable of performing, be made a permanent duty of the department, as these conditions are constantly changing.

8. That cost finding methods be devised which will not only give correct figures but figures which will represent facts which can be made the basis of comparisons and deductions.

9. That a school of instruction for both officers and men in the importance and value of clean streets and in the best methods of work and in the best use of equipment for obtaining them, be given every encouragement.

10. That the plan put into effect by the present Commissioner for enlisting the cooperation of the public, which is excellent, be continued and extended.

The "model district" was established by Commissioner Fetherston. It is a small area in which are included the various street conditions found throughout the city. The primary object of the plan is to establish in this district the most up-to-date methods of work and to install the most approved equipment and gradually extend both to the remainder of the city. The secondary object is to provide a proving ground for new developments in methods of conducting the work, and in equipment. The recommendations affecting this district are as follows:

1. That hand cleaning only be employed, supplemented by flushing or washing with water under pressure.

2. That the intensive method of street cleaning described hereafter be adopted.

3. That the value of inspection can not be over-emphasized in any attempt to maintain high standards of street cleaning, and therefore the supervisory force be composed of A No. 1 men, intelligent, industrious and observing. That the laborers be alert and active and capable of maintaining the standards of work set.

4. That leggings be added to the uniform now used, to protect the trousers and to add completeness to the equipment.

5. That the sidewalks be included with the roadway, and the street cleaned from house line to house line.

6. That the street cleaning implements consist of a broom and shovel for cleaning rough pavements, and a broom and scraper for cleaning smooth pavements, the broom to be made of sufficiently fine material to insure thorough work.

7. The implements used in cleaning the sidewalks to consist of a pan shown in Photograph No. 3, and a horsehair, or other fine broom.

8. That boxes with hinged tops and of sufficient capacity to care for the entire day's output of street dirt, be placed at convenient intervals on the sidewalk, or preferably sunk in the sidewalk, for the temporary storage of the dirt as collected by the street sweeper, and that, for esthetic as well as economic reasons, the street sweepings be collected at night only.

9. That the roadways be flushed nightly with motor-driven machines, carrying tanks, from which the water is forced out under the necessary pressure to obtain efficient washing of the streets. That the sidewalks be washed by machine, and hand squeegeed nightly, or as often as necessary.

10. That a sufficient number of street sweepers be employed after four o'clock, the quitting time of the day force, to pick up the heavy dirt preparatory to flushing the streets, and thus prevent frequent filling of the catchbasins, and possible obstruction of the sewers. The adoption of this plan will mean clean streets practically through the twenty-four hours.

11. That the streets be lightly sprinkled through the day, as often as found necessary. The sprinkling should be confined to the gutters, and the space four or five feet therefrom, for the tendency of traffic and the slope of the streets is to force the dust to the gutter. On streets carrying car tracks, the right of way, which collects considerable dust, should also be lightly sprinkled.

12. That when the temperature does not permit of sprinkling, the men sweeping the sidewalks be required to remove any noticeable collections of dust in the roadways. A vacuum cleaner, if it can be made practicable for this purpose, would serve a valuable end.

13. That the functions of sprinkling, flushing, and removal of street sweepings, be coordinated, if possible, with operation of the power-driven equipment now being installed for the latter purpose.

14. That checks on the density of traffic, changes in pavement, the amount of refuse collected by each sweeper, etc., be made from time to time and followed by such readjustment of the route areas as are found necessary. Also that checks be made at regular intervals to determine if the set standards of cleanliness are being maintained.

Two Miles of Road Built in 48 Hours of Continuous Work is the record recently made by the forces of the Pennsylvania State Highway Department. The work was done at Camp Brumbaugh, where the National Guard of the state was mobilized. The road was graded and treated with a light emulsifying oil.

An Improved Road Between Tampa and Plant City, Fla., has made it possible for a motor truck line to compete with the railroads in the transportation of freight. The distance is 22 miles and the rate charged is the same as that charged by the steam lines, but cartage to and from a station is saved to shippers and consignees. The road is paved with brick.

The New Highway Law and the State Highway Department of Mississippi

As has been noted in previous issues of "Good Roads," a law creating a State Highway Commission was passed at the last session of the Mississippi Legislature, and, in accordance therewith, the members of the commission were appointed.

The commission appointed by the Governor consists of T. M. McBeath of Meridian, W. D. Robbins of Tupelo and W. T. Denman of McComb City. Mr. McBeath was elected chairman and Mr. Denman, secretary. At the first meeting of the commission, Xavier A. Kramer, of Magnolia, was selected as State Highway Engineer, the officer in active charge of the department's work.

Mr. Kramer was born at Magnolia, October 19, 1879. He received a common school education, afterward serving as an apprentice in his father's machine shop from 1893 to 1897. He studied civil engineering through correspondence courses and with the help of local tutors, and acted as foreman and superintendent of construction on building work and in the construction of public utilities from 1897 to 1902.

In 1903 he was appointed County Engineer of Pike County and City Engineer of Magnolia, and has held these positions continuously since that time. In addition to his duties in these two offices he has acted as consulting engineer in the design and construction of many public buildings and public utilities in various parts of the South. Included in the work done by Mr. Kramer has been a large amount of road work. He has had charge of the construction of improved roads in Prentiss, Itawamba, Attala, Covington, Scott, Madison, Copiah, Hinds, Winston, Pontotoc, Pike and other counties of Mississippi involving a total expenditure of several millions of dollars. At the time of his appointment as State Highway Engineer he was consulting engineer in the construction of roads, bridges and public utilities in Pike, Madison, Scott, Copiah, Hinds, Pontotoc and Winston Counties, Mississippi, and in a number of cities and towns in Mississippi, Louisiana, Alabama and Kentucky.

Mr. Kramer was chosen from a number of candidates for the position, and was strongly endorsed by public officials and other citizens of the state.

The main provisions of the new highway law of the state are essentially as follows:

Section 1 provides for the creation of a state highway commission consisting of three members, one from each supreme court district, to be appointed by the Legislature with the advice and consent of the Governor. They are to serve for six years, unless removed by the Governor for cause, the first appointments being one commissioner for two years, one for four years, and one for six years. Vacancies may be filled by the Governor. The members are to serve without pay but are to be allowed actual and necessary expenses incurred in the discharge of their duties.

Section 2 provides that as soon as practicable after the passage of the act the state highway commission shall meet on the call of the Governor and organize by electing one of their number as chairman and another as secretary, and by electing a state highway engineer. The latter must be "a competent civil engineer, experienced and skilled in highway construction and maintenance." His salary is to be fixed by the commission, but must not exceed $2,500 annually. In addition the state highway engineer is allowed his necessary expenses. His term of office is four years, or until removed for cause.

Section 3 provides that the state highway engineer file a bond of $5,000, the premium to be paid by the state.

Section 4 provides that the state highway engineer may appoint, subject to the approval of the commission, an assistant engineer and a clerk, their compensation to be fixed by the commission, provided that the salary of the assistant engineer shall not exceed $1,800 yearly, and that of the clerk, $1,000.

Section 5 provides that the state highway commission and the state highway engineer shall constitute the State Highway Department and that the department shall be provided by the Capitol Commission with suitable offices in the City of Jackson.

Section 6 provides that it shall be the duty of the state highway commission to hold meetings at such intervals as it may deem essential to the proper carrying out of the law, for the purpose of considering and adopting plans for "laying out, opening, altering and working roads and building highways and for vacating any road or highway in this state, and the conduct of the work of highway improvements in general; to receive and consider for adoption at such times as they may elect, the reports of the State Highway Engineer, to expend, subject to such conditions as the grantor may impose, any money or other funds that may be received by the state from the United States, and the money shall be divided among all the counties in proportion to the number of miles of post roads in said counties, or other source for the improvement of highways in this state according to such plans of general highway improvement as said Commission may adopt; to act for the said department in all matters relating to recommendations, reports, and such other matters as it may deem advisable to submit to the State Highway Engineer, boards of supervisors, county road commissioners, or county road engineers touching such highway improvement, and to make bi-annual reports to the Legislature."

XAVIER A. KRAMER,
State Highway Engineer of Mississippi

Section 7 is as follows:

"That the State Highway Engineer shall have charge of all the records of the State Highway Department; shall keep a record of all proceedings and orders pertaining to the business of his office and of the Department; and shall keep on file copies of all plans, specifications and estimates, prepared by his office. He shall cause to be made for and kept by the State Highway Department general plans for the improvement of the highways and bridges of the state, such plans to consist of such of the main traveled roads as will when improved provide a connected system of improved highways throughout the state and of such other roads as may be deemed advisable by said commission, and shall collect information and file statistics with reference to the mileage, character and condition of the said highways and bridges in the different counties of the state. He shall investigate, determine and approve the proper method of road construction and maintenance of highways and bridges in the various counties and adaptability of road and bridge material proper for use, giving due regard to the topography, natural conditions, the prevailing traffic conditions. He shall at all reasonable times be consulted by the county and district officers having authority over highways and bridges relative to any question affecting such highways and bridges, and it shall be his duty to advise such county officers of the proper plans, construction and material for use on the highways of said county. He may in like manner call on such county or district officials for any information they may be able to give in the performance of his duties relative to the highways and bridges either their county or district, and such officials who shall fail or refuse to supply information, when so called upon by said State Highway Engineer, shall be guilty of a misdemeanor, and on conviction, be subject to a fine of not less than ten ($10.00) dollars, nor more than one hundred ($100.00) dollars. That the county (or district) road commissioners and the engineer employed under the laws of this state, shall before submitting their or his report of plans and materials for any highway under contract to the county (or district) road commissioner or to the board of supervisors for their approval submit said report with plans, specifications and estimates on the proposed work, to the State Highway Engineer for his approval, or for suggestions as to revision."

Section 8 provides that any funds granted to the state by the United States or other grantor, for highway improvement shall be expended by the Commission. It also stipulates that at least one meeting shall be held annually in each county of the state if the board of supervisors of the county requests it. This meeting must be attended by a representative of the State Highway Department for the purpose of discussing road matters, and must be attended by county and district road officials who will be entitled to the same per diem as they receive for their other offices. This section also authorizes the railroads in the state to furnish free transportation to the members of the State Highway Commission and its employees while in the performance of their duties. The section also provides that the State Highway Engineer shall make an annual report to the State Highway Commission.

Section 9 authorizes the state highway engineer and his associates to issue a monthly road and bridge publication containing standard plans and specifications, results of tests of materials, reports of work done, statistics, suggestions for the improvement of roads and bridges, and "other such information as may be of service to those engaged in road and bridge work." It also authorizes the commission to mail free copies of these publications to all county and district road officials in the state, and to fix the subscription and sale price at which the publications shall be furnished to those not entitled to free copies.

Section 10 makes available for the use of the department the apparatus and supplies of the University of Mississippi and the Agricultural and Mechanical College for making tests of materials, providing such tests do not interfere with the regular work of the institutions.

Section 11 declares the sections of the act and parts thereof to be independent sections and parts of sections, and provides that the holding of any part thereof to be unconstitutional, void or ineffective for any cause, shall not affect any other section or part thereof.

Section 12 provides that no persons engaged in the sale of road building machinery or material, nor any person interested in any contract to construct roads in the state shall be eligible as a member of the State Highway Commission, or as an engineer under the State Highway Deparment.

Section 13 provides that if the Legislature recommends a bond issue for carrying out the directions or recommendations of the said commission, or for state highway purposes, such recommendations of the bond issue shall first be submitted to the electors of the several counties of the state, and provides that bonds may be voted only if the majority of the electors vote for them.

Section 14 repeals all laws or parts of laws in conflict with the act, and Section 16 provides that the act take effect from and after its passage.

Road Map of South Carolina

A map showing the main public highways of South Carolina has recently been issued by the Department of Agriculture, Commerce and Industries, of which E. J. Watson is commissioner.

On the map, which is drawn on a scale of 10 miles to the inch, are shown the ten arterial roads of the state. These are shown in colors corresponding to those used for marking the routes by bands on telegraph and telephone poles and signboards. The roads shown are the Appalachian Highway, the Old State Road, the New York-Florida Highway North, the New York-Florida Highway South, the Piedmont Highway, the Carolina Highway, the Coast Highway, the Pee Dee Highway, the Trans-Montane Highway and the National Highway.

Printed on the same sheet with the road map are two smaller ones, one showing the roads in the vicinity of Charleston in 1838, and the other showing stage routes in South Carolina in 1838.

Widening the Right of Way at Curves, in order to permit the use of curves of greater radius, was urged by Road Engineer H. E. Bilger of the Illinois State Highway Department in a paper presented at the 1916 Conference on Highway Engineering held at the Kansas State Agricultural College. He also recommended that at all cross-roads additional land should be acquired to allow the highway authorities to control the growth of vegetation obstructing the view. An unobstructed view for at least a thousand feet each way should also be provided at railroad grade crossings, according to Mr. Bilger.

The Right to Enter Upon Private Property for certain purposes is given to engineers and surveyors employed by the state, a county, or a city, town or village, by a Maryland law, which recently became effective. According to the statute such engineers may "enter upon any private lands for the purpose of making surveys, running lines of levels or obtaining any needful information or data for the preparation of plans, reports or new legislation necessary for any proposed public sewerage system, waterworks, establishment of corporate boundaries or any extension of the same, highways or improvements to the same, or any public undertaking of a like nature." It is also provided that engineers so engaged must not damage or destroy any property or lands entered except that they may set stakes, markers, monuments or "other suitable landmarks or reference points where necessary." A fine of not less than $25 nor more than $100, or imprisonment for not less than 30 or more than 60 days, or both, is fixed as the penalty for obstructing engineers working under the authority of the act, or for destroying monuments, stakes, markers or other landmarks set by them.

State Road Construction in New York in 1915

In the State of New York 759.61 miles of road were completed and accepted and 323.74 miles were completed too late for acceptance, making 1,083.35 miles of road actually completed during the calendar year of 1915, according to the annual report of First Deputy Commissioner H. Eltinge Breed, in charge of construction, to Commissioner of Highways Edwin Duffey. From this report, which has recently been made public, the data in the following paragraphs were taken.

There was placed under contract during 1915 a total of 1,073.2 miles of road divided as follows: Water bound macadam, 381 miles; water bound macadam, surface treatment, 176 miles; bituminous macadam, penetration method, 347 miles; bituminous concrete, mixing method, 2.2 miles; cement concrete, 113 miles; brick, 31 miles; other types, 23 miles.

At the close of the year there remained uncompleted but under contract a total of 739 miles. This large mileage uncompleted resulted from three general causes. In the first place, the season was unfavorable because of the frequent and prolonged periods of wet weather. In the second place there was a great scarcity of labor because of the large demands upon aliens made by the countries at war and also because of the increased manufacturing of munitions in this country. In the third place, a considerable amount of the work was awarded during the late summer and the early fall. These three causes, together with the slowness of the counties in securing rights of way, made it impossible for the contractors to complete their work during the year.

The data on the costs of construction of different types of pavements shown in the following table were obtained from pavements having a total thickness of 6 ins. included between Nos. 1 and 1,025, and, in general, cover average condition.

Kind of Road	Cost per sq. yd. of pavement only	Cost per mile of 16-26 ft. highway
Water bound macadam	$0.648	$10,250
Bituminous macadam	0.871	10,970
First-class concrete, 6 ins. thick	1.121	15,320
Brick pavement on 5-in. concrete foundation	2.015	25,750

The cost per sq. yd. of water bound macadam was obtained from 434 values and the cost per mile from 419 values. Both costs for bituminous macadam were obtained from an average of 134 highways; both costs for concrete from an average of 20 highways, and both costs for brick from an average of 23 highways.

The work of preparing plans and estimates involved comprehensive study of the plans submitted by the division engineers, especial attention having been paid to the adequacy of the type of pavement selected to the traffic conditions under which it was to be used, to the location of available road building materials, to the character and condition of the soil, and to the economy of design and the adjustment of grades. In connection with the plans and specifications there were made out and checked 19,000 itemized proposals for construction contracts, and 12,000 proposals for maintenance contracts, all the work having been done in the department offices. There were prepared and advertised during the year 259 construction contracts covering 1,073 miles of road, 184 maintenance contracts for 1,714 miles of road, and 34 contracts for broken stone. Detailed examinations of final estimates were made for 179 contracts which were finally checked in the department. There were also made 115 authorizations for extra work.

The Bureau of Tests comprises three divisions—a physical testing laboratory, a chemical laboratory and an office of record. The force of the physical testing laboratory makes all field examinations, surveys and tests of stone, gravel, slag, cement, sand and concrete. All samples of asphalts, tars, paints, oils, etc., are tested in the chemical laboratory. The office of record compiles and tabulates the records of tests of both laboratories for the use of the department. The work of the bureau has included, besides testing and examining materials, the giving of instruction to the field engineers in charge of construction work. This work has been supplemented by reporting to the field engineers the results of all tests which would aid them in their work.

During 1915 the bureau performed 1,748 tests on oils, asphalts, asphalt blocks, paints, etc., at a total cost of $11,932.02, or an average of $6.83 per test; 269 tests of brick at a total cost of $2,071.59, or an average of $7.70 per test; 867 tests on cement at a total cost of $9,945.29, or an average per test of $11.47; 1,444 tests on concrete cubes at a total cost of $1,143.97, or an average per test of $0.79; 973 tests on sand and gravel at a total cost of $3,949.81, or $4.06 per test, and 947 tests on stone at a total cost of $2,646.22, or an average of $2.79 per test.

In addition to the laboratory work of the bureau there were made 150 special investigations, classified as follows:

1. Preliminary investigations of materials on proposed roads to determine the type and estimated cost of the surfacing.
2. The inspection of commercial sand and stone supplies to insure uniformly good material for imported highway surfacing.
3. The inspection of those materials on highways under construction which have caused difficulties.
4. The study of the uses of different materials and their use under traffic, with regard to the effect upon future types.

The Height of Street Signs *

In summarizing the data collected relative to the height at which street name signs are placed, considerable variation is noted. The minimum height stated was 7 ft. and the maximum 12 ft., while 8 to 10 ft. seemed to be the average height of the ordinary street name sign above the ground. In general, the lower figures refer to signs placed on independent standards, a condition more commonly encountered in residential districts; while heights of 10 to 12 ft. are in relatively common use for "flange" signs and those making use of available trolley poles, electroliers and other poles for support. There seems to exist a tendency to place street name signs somewhat higher throughout business districts, presumably so that traffic will tend less to obstruct the easy reading of the sign. Often they are placed so high that those riding in street cars on crowded streets, especially when standing, find it difficult to read them.

In residential districts it might be advisable to exceed somewhat the low height of 7 ft. or 7 ft. 6 ins., in order that boys may not be tempted to jump and hang from the signs, a troublesome practice which has required the repairing of signs and posts in certain instances.

In this connection experience seems to show that the sign standards are frequently planted in the ground to an insufficient depth. A minimum depth of 3 ft. is suggested, while undoubtedly 4 ft., as specified in Columbus for 4 by 4 wood posts, would be better. Small posts of pipe or cast iron are best set in concrete, a depth of 2 to 3 ft. being sufficient ordinarily, with 6 or 8 ins. of concrete on each side of the post. Common practice provides an iron pin through the buried portion of the post, or some similar device, to prevent its turning.

Street name signs on buildings are usually placed about as high as the top of the first story, or, as in Fall River, Mass., at the height of the first story windows.

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*From "Street Name Signs," by Rolland S. Wallis, Bulletin 20, Engineering Extension Department Technical Service, Iowa State College of Agriculture and Mechanic Arts, Ames, Ia.

Rodman Wiley, the New Commissioner of Public Roads of Kentucky

Rodman Wiley, formerly Bridge Engineer in the Kentucky Department of Public Roads, recently succeeded Robert C. Terrell as Commissioner of Public Roads, as has been announced in previous issues of "Good Roads."

Mr. Wiley is thirty-three years of age and is an associate member of the American Society of Civil Engineers. He graduated from the Civil Engineering Department of the Kentucky State College in 1906.

Since graduation Mr. Wiley has followed his profession, holding a number of positions in which he has acquired a varied experience. For four months he was a draftsman on hydo-electric work with Hugh L. Cooper, a consulting engineer. Following this he was an assistant engineer with Viele, Blackwell & Buck, Consulting Engineers, of New York, N. Y. During this time he was engaged on the construction of a hydro-electric power plant known as the Feather River project, for the Great Western Power Co. He then worked for nearly two years as Chief Engineer and Superintendent of Construction for the Livermore Water & Power Co., of Livermore, Cal. His next position was that of engineer in charge of overflow basin surveys for the Hydraulic Engineering Co. of Maine. He occupied this position for seven months.

RODMAN WILEY,
Commissioner of Public Roads of Kentucky

Mr. Wiley then worked for ten months in a rigging gang on the construction of the Keokuk project of the Mississippi River Power Co., doing this work for the sake of experience.

Between this time and his appointment as Bridge Engineer of the Department of Public Roads of Kentucky, which he held for two years and eight months, Mr. Wiley was engaged on tunnel work in Mexico. During the first three months of his employment on this work he was the Assistant Superintendent of Tunnel Construction for the Mexican Light & Power Co., and for the remaining eleven months, Tunnel Superintendent on the same work under the supervision of Jacobs & Davies, Inc., of New York, N. Y.

Resurfacing Old Stone Block Pavement in New Orleans, Louisiana

About a year ago several contracts were made in New Orleans, La., for laying bituminous surfacing on old stone block pavements. The blocks were of granite and from 12 x 15 to 15 x 18 ins. in size.

It was believed at that time that laying bituminous wearing surfaces on these old pavements would effect certain economies and that, on completion, the resulting pavement would be more durable than a modern pavement consisting of the same kind of wearing surface on a cement concrete foundation.

It has been found, however, that an unduly large amount of material has to be used because of the unevenness of the old stone pavements. In order to secure a wearing surface nowhere less than 1½ ins. thick it was necessary to lay a thickness of from 3½ to 4 ins. in some places. The cost of this excessive depth of surfacing, with other costs incident to the work, brings the total to a greater amount than that required for the construction of a modern asphaltic pavement on a concrete base.

In addition, it has been found that the pavement is likely to settle in places as the old stone blocks were laid directly upon the natural soil and are subject to displacement under unusual traffic.

"Don'ts" for Good Roads Days

One of the provisions of the Alabama law establishing August 14 and 15 of each year as "good roads days" is that the State Highway Department must publish annually a good roads day program or booklet containing the governor's proclamation and other pertinent matter. In that publication for the current year there was included among other matter the subjoined list of "Don'ts." While these admonitions specifically refer to good roads days in this case, most of them are of every-day application. The list, as printed, follows:

SOME "DON'TS" FOR THE THOUGHTLESS

Don't wait for your neighbor to start something, start it yourself.

Don't wait for the county commissioners to have that hole in the road, about the size of a water bucket, in front of your gate, filled. Fill it yourself.

Don't forget that water won't run up hill and the rough place in front of your house is caused by you in placing obstructions in the ditch to prevent the water going its natural course.

Don't spend fifteen minutes hitching your horse to the buggy to drive ten miles to tell the probate judge that there is a hole in the bridge near your place—spend the time fixing the bridge.

Don't kick about the bad roads when you are violating the law by turning water from natural channels into the public highway. Would you permit the county at will to turn water on your farm?

Don't try to carry water and traffic in the same place. One or the other must seek a new location—Alabama is dry.

Don't crown a gravel or sand-clay road high and have little, narrow, deep ditches on the sides. You may think you know it all, but you don't. You have only to see such roads as those in Dallas, Montgomery and Houston counties to be convinced of your folly.

Don't put gravel on a soft foundation and not expect it to go down and the mud up. You might as well expect a rock to float when you throw it in a pond.

Don't forget you owe something to the public and that to live alone for yourself and family is narrowness, and if followed by all others would destroy the world.

Don't forget that a good road is a road with a tight roof and a dry cellar.

The Bridge Connecting Portland and South Portland, Me., was recently opened to the public. The structure is of steel and reinforced concrete and cost about $1,000,000. It is about 4,000 ft. in length and has a 266-ft. draw span. The roadway is 60 ft. wide.

The Outlook for Road Building in Michigan for 1916*

By FRANK F. ROGERS†

Michigan has approximately 70,000 miles of public wagon roads outside the corporate limits of villages and cities. These roads necessarily carry a varying traffic, ranging from approximately 3,000 vehicles per day down to roads which do not see even a single vehicle on certain days. The roads not being of equal importance from a traffic standpoint, and over soils ranging from the hardest clays to dune sands, require widely different kinds of improvement. But when we think of the road problem of any state we do not expect that all of the roads will ever be substantially improved. Some of them would be quite satisfactory if well drained and improved as earth roads, or if on sandy soils, given some covering of clay or such other material as might harden the surface.

But since it is estimated that one-tenth of the road mileage of any state accommodates fully 80 per cent. of the traffic, it will be seen that from 7,000 to 10,000 miles of the main highways carefully selected and improved would practically solve Michigan's road problem. In fact Michigan has less than 10,000 miles of railroads, including the interurban electrics, and they reach almost every town in the state. Hence we have estimated that if we can improve in a substantial way some 15,000 miles of the main highways, we shall reach every city, village, hamlet and railway station on all of the main roads, which approach them.

Michigan began to improve its roads with state aid in July, 1905. Since that time the miles of state reward roads completed by years are as follows:

Year	Miles	Year	Miles
1905	18.00	1910	304.25
1906	64.25	1911	382.75
1907	96.60	1912	523.06
1908	161.00	1913	696.25
1909	204.50	1914	757.34

Between July 1, 1915, and December 1, 1915, 884 miles of roads were completed, making a total of 4,082 miles to date.

Thus it will be seen from the foregoing that by the close of the present fiscal year, June 30, there will have been completed for state reward in Michigan fully 4,200 miles of highways. These highways for the most part are located on the main lines of road reaching out from the various market places of the state, but have not extended far enough to become connected at the ends, but the building of some 10,000 miles more of properly located highways will connect up the roads already built and give to Michigan a system of highways which will not only reach all the market places, but which will make continuous lines of roads from town to town all over the state which may be traveled with ease and comfort every day in the year.

From the foregoing table showing the progress in miles of improved roads during the past ten years, it is apparent that fully one-third of the roads improved have been built during the past two years and that the state is now fast approaching the time when fully 1,000 miles of first-class roads will be built annually. That being true ten years or less should see the main roads improved in the manner already described, and the dreams of the good roads boosters of our state will have been realized.

But future progress will depend largely on the state's ability to meet its portion of the cost. Already the counties and townships are willing to build more than roads enough to take the state appropriations, the growth of which has been phenomenal. See table of road taxes since 1905:

MICHIGAN'S ROAD TAXES, 1905-1916.

Year.	Township Road Tax.	County Road Tax.	State Reward Tax.	Total.
1905	$2,976,077.47	$285,963.80	$30,000	$3,292,041.27
1906	2,988,989.17	420,321,10	60,000	3,469,310.27
1907	3,091,647.59	421,307.07	110,000	3,622,954.66
1908	2,916,817.01	529,452.45	160,000	3,606,269.46
1909	3,014,344.94	741,868.05	150,000	3,006,212.99
1910	3,264,049.30	859,157.50	150,000	4,273,206.80
1911	3,448,309.37	815,227.24	245,000	4,508,536.61
1912	3,845,834.89	1,308,043.13	245,000	5,398,878.02
1913	4,336,029.59	1,621,681.04	800,000	6,757,710.63
1914	4,647,016.86	1,882,728.88	320,000	6,849,745.74
			*600,000	
1915	5,714,837.81	2,474,771.26	975,000	9,764,609.07
1916	....		580,000	580,000.00
			†800,000	800,000.00
Total	$40,243,954.00	$11,360,521.52	$5,225,000	$56,829,475.52

*Deficiency appropriation. †Automobile tax, estimated.

What the state is able to do in 1916 is problematical. It is estimated that the taxes from the new auomobile law will be upward of one and one-half millions of dollars, only one-half of which is to be credited to the state, to be distributed by the State Highway Department, the other half being returned to the counties from which it is received, but all to be used for the building or maintenance of highways. But the new automobile tax law is now before the courts to test its constitutionality, and the outcome is uncertain.** Should the law again be declared unconstitutional, road building in Michigan will receive a severe blow. There would still remain however, in the trunk line appropriation, $550,000, which must be used for paying one-half of the rewards due on the trunk lines, building trunk line bridges, making trunk line surveys, etc. In addition to the above there is an appropriation of $30,000 for general departmental expenses.

On the other hand should the automobile tax law be sustained the state will have for road purposes during the fiscal year 1916-17 approximately $1,380,000, which should pay the state rewards on fully 1,000 miles of new highways and build fifteen or twenty trunk line bridges. But should the automobile tax money be lost, it seems to the writer that a one-half mill state highway tax, which on the present state valuation would yield $1,400,000, should be enacted by the next Legislature, and the state's portion of road improvement should be kept within the appropriation.

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*Paper presented at the meeting of the League of Michigan Municipalities, Battle Creek, Mich., June 28-30, 1916.

†State Highway Commissioner of Michigan

**The Michigan Supreme Court has handed down a favorable decision and state rewards are now being paid from money collected under the law.

Grading at a Cost of 7.5 cts. per Cu. Yd. has been done in the prosecution of Utah road work. Graders hauled by gasoline tractors were used, a minimum cost of slightly less than 4 cts. per cu. yd. being reported.

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ACCIDENTS AT GRADE CROSSINGS

An extract from a paper by Commissioner Gordon of the California State Railroad Commission, printed on other pages of this issue, contains much valuable and interesting information on the subject of grade crossing accidents. It merits the attention not only of road builders, but also of that portion of the public which advocates the immediate elimination of all grade crossings.

One of the most significant and interesting features of Commissioner Gordon's paper is his report of the Southern Pacific Company's investigation of the behavior of drivers at 34 of its grade crossings. According to the figures given, practically 70 per cent. of the drivers of automobiles and 40 per cent. of the drivers of horse-drawn vehicles looked in neither direction before crossing the tracks. Less than 30 per cent. of the automobile drivers and only about 50 per cent. of the drivers of horse-drawn vehicles looked in both directions before crossing. As 17,000 motor vehicle drivers and 4,900 drivers of teams were observed, these figures show that almost exactly two-thirds of all the drivers crossed the tracks without looking either to the right or to the left—in other words, without taking even reasonable precautions. If all drivers are as careless, the wonder is not that there are so many accidents, but that there are so few.

Equally interesting is the tabulation showing the causes of accidents resulting in deaths and injuries. Among the causes enumerated are only two—"ran into side of train" and "stalled on track"—that might possibly result from anything but carelessness. And these two causes account for only 17.9 per cent. of the deaths and 19.5 per cent. of the injuries.

If the figures given here and the others recorded by Commissioner Gordon show anything, it is that most of the grade crossing accidents are unnecessary.

Before considering the remedies for crossing accidents it may be profitable to review the situation briefly. In the first place we are warranted in assuming that a very large proportion, certainly 75 per cent., of such accidents are avoidable. In the second place it seems evident that, excepting carelessness and a few unusual causes such as losing control of the car because of some failure in the mechanism or a sudden physical disability of the driver, the most common if not the only real cause for a crossing accident is the inability of a driver to see an approaching train. It is impossible, of course, to provide against the unusual accidents that may occasionally occur. It is left then to find remedies for the most common causes—reckless driving which accounts for the major portion of the accidents, and the inability to see approaching trains.

The only sure remedy is the separation of the grades at each intersection and nothing should be allowed to interfere with the accomplishment of this as fast as possible with the funds available. But this work will take time because of its great cost. To effect a separation of grades at all highway and railway intersections in California alone, according to Commissioner Gordon's statistics, would cost over three hundred million dollars, an expenditure which, as he pointed out, neither the public nor the railroads could afford.

Leaving elimination out of consideration, there are still many remedies. The more common ones include the installation of gates, the stationing of flagmen, and the erection of mechanical warning signals of various kinds. Gates, according to Commissioner Gordon, cost about $700 to install and about $900 yearly for operation and maintenance; flagmen cost about $600 yearly, and automatic signals from $350 to $600 for installation and from $24 to $120 annually for maintenance. These figures are presumably for California, but they will serve as indications of the cost elsewhere, and they show that even the cheapest and probably least effective of these remedies is too expensive to permit its immediate establishment at all crossings.

Among the remedies noted by Commissioner Gordon are laws requiring motor vehicles to come to a full stop before crossing the tracks and laws requiring low speed when approaching a crossing. It is doubtful if such laws would prove effective. Many of the most dangerous unprotected crossings are outside of cities and villages where it would be impracticable to station officers to enforce the law, and if the law of self-preservation will not check reckless driving it is not likely that a non-enforcible statute will do so.

There are, however, two remedies that would undoubtedly greatly reduce the annual toll of deaths and injuries chargeable to the railroad crossing. The first is the enactment of more drastic laws against reckless driving, especially against driving while intoxicated. In many states the penalty for a conviction of the latter offense is too light. If it were made heavier—or if the right to drive at all were granted less freely—a decided decrease in the number of accidents might be expected.

The second remedy consists of the correction of the condition previously noted—the inability of the driver to see approaching trains. It is realized that in some cases this could not be done, but usually the clearing away of trees and underbrush or the removal of a bank would make a crossing perfectly safe, if the driver took even the most ordinary precautions.

Making safe roads is as important as making "good" roads, and the grade crossing is one of the greatest single dangers of the road. By studying each crossing that is dangerous to the careful driver and adopting for it the most effective remedy that can be afforded, the number of accidents that under present conditions are unavoidable can be greatly lessened. There will always be avoidable accidents at crossings not inherently dangerous, but these can be reduced in number by the enactment and enforcement of strict laws against recklessness.

DISTRIBUTING THE COST OF ROAD WORK

The ideal distribution of the cost of highway work—the levying upon each individual of a tax exactly proportional to the benefit he derives from the expenditures made for the construction, improvement, repair and maintenance of roads and streets—is obviously impossible. At the same time, a more nearly equitable division of the burden than is now made is quite within the bounds of possibility and practicability.

The motor-driven vehicle is chiefly responsible for the large expenditures now required for road and street work, and this has been recognized by taxing such vehicles and using the proceeds for road work. Various methods of taxation have been suggested and tried but in few, if any, cases has a rational basis been fixed upon. An automobile should be taxed upon an ad valorem basis, like any other piece of property, and it should also be taxed as nearly as possible in proportion to the wear to which it subjects the roads. Obviously the wear due to a car will vary roughly as the weight and speed of the car and the mileage it makes. Only the first of these factors is ordinarily taken into account in determining the amount to be paid as a license fee or tax.

It is manifestly impracticable to levy taxes upon the basis of speed. It is also impracticable to levy taxes directly upon mileage, so it becomes necessary to seek some other basis upon which to adjust the burden. The amount of gasoline used furnishes what is probably the best index of the amount that should be assessed against a motor vehicle to pay for the wear to which it subjects the roads it traverses. Two of the three factors previously mentioned—weight and mileage—would be taken indirectly into account by that method, for other things being equal, the heavier a car the more gasoline it would use, and, similarly, the greater the mileage made the greater the consumption of gasoline. Why would not a very small tax on each gallon of gasoline consumed—to be paid in every case by the user—be a fairer method than those in force at present?

AN UNUSUAL OPPORTUNITY IN HIGHWAY ENGINEERING

By the terms of the new federal aid law there is laid upon the Secretary of Agriculture the duty of passing upon road improvements proposed as federal aid projects by state officials; of determining whether roads improved under the law have been built in compliance with the plans, specifications and estimates he has approved, so that he may allow or disallow payments by the government; and of withholding further allotments to any state in which roads improved partly with government funds are not properly maintained.

The words "Secretary of Agriculture" of course are not to be construed literally, for the actual work will be done by subordinates in some bureau of the Department of Agriculture, presumably the Office of Public Roads and Rural Engineering. The duties that will fall upon this or some other bureau carry with them large responsibilities and unusual opportunities. Federal supervision over actual road work on any considerable scale will be a new departure for the central government, and its operation will be watched with great interest by highway officials and engineers. It is to be hoped that it will be carried on efficiently and economically in a way to reflect credit upon all concerned. The whole matter rests with Secretary Houston and those he appoints to assist him in administering the law.

The provisions of the law relating to the supervisory functions of the federal government admit of widely different interpretations. Upon submission of plans, specifications and estimates from the state officials it is the duty of the Secretary of Agriculture to approve of "only such projects as may be substantial in character." Upon completion of work which has been approved, the Secretary must again pass upon it for the purpose of allowing payments. In the words of the law, "When the Secretary of Agriculture shall find that any project so approved by him has been constructed in compliance with said plans and specifications, he shall cause to be paid to the proper authority of said state the amount set aside for said project." It seems evident that it is within the discretion of the federal authorities to make their work merely perfunctory, to exercise a very real control, or to adopt any course between these two. It is impossible to predict at this time just how much the federal government will take upon itself. Furthermore there does not appear to be unanimity of opinion among engineers as to just how much the central government should take upon itself.

If any considerable degree of control over the kinds of roads built and the methods of construction followed is assumed by the government, the work will demand the services of engineers of the very greatest skill and the most unquestioned integrity. Conditions of climate, topography, traffic and availability of funds vary so greatly over the country that only engineers of the widest experience will be capable of passing upon plans from different sections, and unless such men can be found, the more such questions are left to the local authorities the better will be the results.

If the work is kept out of politics and is conducted efficiently and economically, engineers who find places in the organization will have unusual opportunities to distinguish themselves in a branch of engineering which heretofore has not been accorded the recognition that it deserves.

Reduction in the Crown of City Pavements is favored in a recent report made by engineers of a Chicago (Ill.) traction company. Complaint is made of the impeding of street cars by teaming off the tracks and it is stated that such use of the car tracks results, to some extent, from the excessive crowning of the pavements.

Why Engineers Fail to Drain Roads

BY J. S. BIXBY*

There appeared in "Good Roads" for August 5 an interesting article by George C. Warren, very strongly advocating the systematic drainage of improved highways by subsurface drains. This phase of the question of drainage, he states, has been shamefully neglected by engineers in charge of road construction.

That Mr. Warren is well within the facts in regard to the lack of subsurface drainage on nearly all of the existing hard-surfaced roads there is no question; but the very fact that subsurface drainage is so universally neglected makes it necessary to carefully examine the advantages and disadvantages of the system rejected before assuming that the majority of road engineers are delinquent in planning for such a system of drainage.

As Mr. Warren has presented only the advantages of the plan of subsurface drainage, putting the matter clearly up to the engineer, it is the purpose of this article to present briefly a few points which may indicate that subsurface drains are not a panacea for all road troubles and show why engineers fail to drain roads.

The following points will be considered:

1. Drainage not a Substitute for Foundations.
2. Cost.
3. Outlets.
4. Radius of Action.
5. Duration of Service.
6. Records.

1. Drainage Not a Substitute for Foundations.—In considering the subject of drainage possibly the greatest error is made in assuming that any system of underground pipes, or stone-filled trenches, is a substitute for foundation, or that if a road of certain thickness is necessary to support traffic, the foundation may be cut down if subsurface drains are provided. Experience indicates that this is a fallacy, as in many cases it has been found that an elaborate and costly system of drains fails to provide firm and stable subgrade at all seasons of the year; in other cases, that according to the consistency of the soil, the radius of action or influence of the drain is so restricted that the pavement will fail from soggy subgrade within 3 or 4 feet of a stone-filled trench. Again, it has been observed that pipe outlets laid but a relatively short time have become ineffective. These points will be treated more in detail later, but the conclusion may be drawn here that it is open to serious question whether or not subsurface drains will insure a firm, dry subgrade over a considerable period of years. Unless such a stable subgrade is assured, no engineer is warranted in reducing the thickness of a road on the strength of underground waterways.

Further, there is a period in early spring when all broken stone roads and subgrades, excepting rock, become more or less soft, and it has been clearly demonstrated in a number of instances that subsurface drainage will not prevent this condition. At this time roads will not support heavy truck traffic unless there is weight and bulk of foundation below the road to offset the weight and impact of the traffic. The truck traffic of early spring is a new development, but observations made up to the present indicate that an expensive and high class system of drains will not save a "thin" road under the conditions noted above. In conclusion it appears that whatever the merits of subdrains, they can not be consistently advocated because of the expense that may be avoided in the matter of foundation.

2. Cost.—It must be conceded by anyone familiar with the details of such work that subsurface drainage is expensive. The simplest form of trench side-drains, say 3 ft. deep, will cost, including excavation, pipe, and stone fill for both sides of the road, $1,500 per mile, while the more elaborate subdrains will run as high as $5,000 per mile. It may be stated that these figures are not based on approximate estimates, but on the actual cost of work. With the cost of broken stone roads running from $8,000 to $13,000 per mile, the drains will show an increased cost of from 10 per cent. to 50 per cent. Considering the cost, therefore, no engineer is justified in including subdrains in his plans unless he is convinced that the benefits derived fully warrant the expenditure. This is not an argument for shortsighted economy in the construction of highways, but a question of the value received for heavy expenditure. As against the cost of subsurface drainage, it is interesting to consider that an expenditure of $1,500 to $5,000 per mile will provide, in localities where field or wall stone is plentiful, a depth of from 6 to 12 ins. of extra foundation. Such reinforcement has been much neglected in the past, but it is rapidly becoming apparent that heavy foundations are the best possible insurance against road destruction either from frost action or from heavy traffic with soft subgrade conditions.

An investigation of the roads that "failed" during the recent spring—a season of trying conditions—indicates that they may nearly all be included in the class of "thin" roads, while nearly all of the surfacing with extra foundation remained in good condition, after a most severe test. How, then, can an engineer be expected to heavily increase the cost of construction by the use of subsurface drains which, at best, must be assigned to the doubtful class, when a corresponding increase in cost might be put into heavy foundations which are daily demonstrating their value?

3. Outlets.—The point may be raised here that a mileage cost of subdrainage is not a fair basis, as only certain short sections of a road may demand such improvement. This appears reasonable, but the field work of placing subdrains quickly develops the fact that such drains must, in most cases, be fairly continuous, owing to outlet problems or difficulties. While in a few cases only 200 or 300 ft. of road may be so wet as to require drains, it is usually necessary to extend the trench to the nearest culvert for the purpose of outlet. Engineers discover in actual field work that the only practical way to install underground drains is in a system that is practically continuous. A difficulty often arises from the fact that certain road grades are too slight to provide adequate fall for underground pipes, making it necessary to increase the depth of the trench toward the outfall end. So it is clear that some small part of the prejudice of the engineer to underground drains is due to outlet difficulties.

4.—Radius of Action.—Let us assume, however, that the engineer has been relieved of the embarrassing dilemma of having to reduce foundations in order to put in drains, or of putting in both and making the cost of his road almost prohibitive. Let us assume that the construction difficulties have been overcome and that the subdrains have been placed. What will be the results? While there can be no question that the tendency will be toward improved subgrade conditions, the outstanding defect in the performance of drains appears to be their narrow and restricted radius of action. While in the immediate vicinity of an underground pipe the ground may be well drained, a very few feet away the effect will seem to be negligible. The following instances are from actual observations:

(a). Over 1,000 ft. of 6-in. macadam boiled and failed completely from frost, water and traffic action, with subsurface drains 4 ft. deep, piped, stone filled, and in good condition, paralleling the macadam right and left, less than 2 ft. from the macadam edge.

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*Assistant Engineer, New York State Department of Highways.

(b). On a road under construction, water 6 ins. or more in depth stood for 36 hours in the macadam trench, separated by less than 2 ft. of earth from drains similar to those noted above. After 36 hours, weep ditches were opened directly into the side drains to empty this water. There was apparently no percolation into the side drains.

(c). Test pits have been dug in road shoulders in the spring and the underground water level has been found to be within 6 ins. of the surface on a section provided with subsurface drains.

These results no doubt occurred under exceptional conditions, but it is as a remedy for exceptional conditions that subdrainage is advocated. The results are not remarkable when we consider that most soggy subgrades are found, not in sandy, gravelly or porous soils, but over clay, clay-loam and muck. The latter soils, especially clay-loam, seem to have a remarkable faculty to absorb water, and permit very little percolation of water through any considerable distance. It will be recalled that on earth dams with rubble cores, clay is recognized as a puddling material to prevent the percolation of water. It thus appears that, in many cases the engineer may spend a large sum of money on underdrains only to find a few narrow, well drained sections immediately adjacent to his trenches, with other sections failing from unstable subgrade only a few feet away.

5. Duration of Service.—If subsurface drains were satisfactory in all other respects, the life of the drain need not be greatly considered, as means would be devised and ways would be found to make the drains permanent and lasting. But as matters now stand if a system is installed, and found to be more or less of a failure, it has a tendency to drop out of sight and be forgotten. Under these circumstances the outlets become obstructed and the underground pipes soon lose what value they may have had when installed.

6. Records.—Related to this is the difficulty of keeping office records of underground construction and of providing for its regular inspection and maintenance. Even cities with elaborate maps and continuing organizations find difficulties in that respect. With the tremendous increase in improved highways, many in sections remote from a central office, the tendency is to overlook the records of subsurface construction, if made, and to fail to provide for regular inspection.

After indicating some of the points adverse to subsurface drainage, it must in fairness be stated that for several special conditions it appears to be a successful and practical solution. Examples may be cited of the tapping and draining of springs or running water in the subgrade; or, on a "side hill road," of the cutting off, on the upper side of the road, of the underground water which has a tendency to flow down and across the road. It must be noted, however, that in the first case the water is concentrated and that the drain is not designed to collect the water over a considerable area, while in the second case the design is to provide a cut-off to keep the water from reaching the road. The underdrain may be both valuable and successful in remedying these conditions, and at the same time be neither economical or practical as an agent for remedying a normally wet and unstable subgrade.

For a number of years publications and text-books have emphasized the importance of the underground drain. At good roads conventions no speech has been complete without its reference to road drainage, and astonishment has been continually expressed at the laxity of the road engineers who failed to adopt this fundamental plan. At the same time, great highway organizations have adopted "subdrainage" as a settled policy and then proceeded to eliminate it from their plans, while highway engineers in general have consistently failed to make use of its supposed advantages.

With such a divergence between theory and practice, it appears that it is now high time to consider whether the difficulty is with the written and spoken theory, or with general engineering practice; to discover whether the future soundness of heavy duty roads will depend on elaborate systems of subsurface drainage or on extra thickness of foundation, and to inquire whether highway engineers in general are guilty of negligence, or whether there is the possibility that they are displaying sound engineering judgment.

NEWS NOTES

Plans have been completed by the State Engineer's office of Arkansas, for 40 miles of roads in Crittenden County, Ark. The estimated cost is $177,000 and 14 miles will be of concrete.

Transcontinental Automobile Touring has increased this year, according to the American Automobile Association. Extensive automobile touring in this country, it is further stated, has become a reality only during the past two years. Travel over the north and south routes across the country has also increased, and this is ascribed largely to the great improvement of roads in the South.

Enameled Iron Street Signs are used to a greater or less extent in 50 per cent. of the cities from which data were obtained by Rolland S. Wallis, according to the results of his investigations, reported in "Street Name Signs," Bulletin 20, of the Iowa State College at Ames, Ia. The many kinds of signs used in various cities are described at some length by Mr. Wallis, and their costs and qualities discussed.

In Birmingham, Ala., a Tax of $5 per year for street work has been levied on every male inhabitant over 21 and under 45 years of age. The tax was laid as an emergency measure to make up the deficit occasioned by an injunction brought to prevent the city from using a special tax levied to pay the interest on its bonds. It is provided that any one liable for the tax may put in six days' work on the streets in lieu of making the money payment if he so elects. A fine of not less than $5 nor more than $10 is the penalty for failing to pay the tax in either cash or labor.

The First Wood Pavements for City Streets, as shown by records, were laid in New York City in 1835, according to a paper entitled "Creosoted Wood Block Pavement," read by F. P. Hamilton before the Louisiana Engineering Society and printed in the current issue of the Society's "Proceedings." This work was followed in 1839 by the laying of hexagonal hemlock blocks and square spruce blocks on streets in Philadelphia, Pa. The use of wood blocks bedded in gravel was commenced in London, England, at the same time. Wood pavement was introduced in Paris in 1859.

Aid from California for the Construction of a Road in Nevada has been asked by the officials of the Lincoln Highway Association, according to recent advices. There are 25 miles of highway in the Fallon Sink in Nevada which need improvement, besides many other sections of road along the Lincoln Highway in that state which need repair, it is stated, and efforts are being made to raise the sum of $50,000 in northern California for this purpose. According to the plan of the Lincoln Highway Association officials who, it is reported, claim that the northern section of California is losing many tourists because of the poor road across the sink, the money raised in northern California will be used with an equal amount secured in Nevada. This plan of raising money was proposed at a meeting held at Sacramento.

A Floating Plank Roadway, composed of several units or sections and held in place by cables was recently used in Los Angeles County, Cal., to take the place of a ford which had been used by traffic during the building of a new bridge. The water at the ford was so deep that the carbureter of an automobile was usually submerged, and to obviate the necessity of keeping teams at hand to tow motor cars across, the floating bridge was decided upon. The plan was expected to prevent the automobile wheels from sinking into the sand of the river bottom and to raise the car an amount equal to the thickness of the planking so that a crossing could be made without submerging the carbureter. As a matter of fact, the units of which the roadway was composed were found to have sufficient buoyancy to permit light cars at a fair rate of speed to cross with very little wetting of the wheels.

COMING MEETINGS

September 4-8—Southern Appalachian Good Roads Association—Ninth annual convention, Lexington, Ky. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

September 13-14—New York State Association of County Superintendents of Highways—Meeting, Syracuse, N. Y. Chairman, Executive Committee, George S. Tibbits, Oneida, N. Y.

September 14-16—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

September 26-28—League of Virginia Municipalities—Annual meeting, Clifton Forge, Va. Secretary, Luther C. Brinson, Portsmouth, Va.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

New York State Association of County Superintendents of Highways

Attention is called to the change of date announced for the meeting of the New York State Association of County Superintendents of Highways at Syracuse, N. Y., from September 14 and 15 to September 13 and 14. Through an error in the announcement received the date was printed September 14 and 15 in the issue of "Good Roads" for August 26.

National Paving Brick Manufacturers Association.

The National Paving Brick Manufacturers Association will hold a conference on brick paving construction on October 5 and 6, as was noted in "Good Roads" for August 19. The headquarters of the conference will be at the Deming Hotel, Terre Haute, Ind., and a demonstration of actual work will be given at Paris, Ill.

According to a tentative announcement of the conference, those in attendance will go from the Terre Haute headquarters to Paris by interurban railway on Friday, October 6. The running time is about an hour.

The demonstration will consist principally of the illustration of the various steps in the construction of a brick pavement, laying the blocks on green concrete mortar. Its purpose will be to show how a pavement laid in this way can be built at the lowest possible cost and yet in the best possible manner.

Everyone engaged in road work and all those interested in such work will be welcomed at the conference. Attention is called to the selection of a date which makes it possible for members of the American Society of Municipal Improvements on their way to the annual meeting of that society at Newark to stop over at Terre Haute. Attention is also called to the fact that chambers of commerce, automobile clubs and other organizations which take a deep interest in the economic phases of road work will be given an opportunity to make a careful investigation and examination of the monolithic method of brick pavement construction.

Full particulars regarding the program, the arrival and departure of trains, and other information can be obtained from Will P. Blair, Secretary, National Paving Brick Manufacturers Association, 830-834 Brotherhood of Locomotive Engineers' Building, Cleveland, Ohio.

MEETINGS

Wisconsin League of Municipalities

The Wisconsin League of Municipalities held its eighteenth annual meeting at Oshkosh, Wis., on August 16, 17 and 18. The delegates were welcomed in an address by Mayor Mulva of Oshkosh.

Numerous papers were read and discussed at the different sessions, among them being the following: "New Street Lighting," Arthur J. Sweet, Milwaukee; "Construction and Maintenance of Macadam Roads by Means of Refined Tar," Prof. Crandall; "The Highway Law and Its Injustice to Cities," Alderman Frank Lucas, Madison.

It was decided to hold the next annual meeting at Racine.

TRADE NOTES

The Northern Michigan Road Builders' Association was adopted as the name of the organization heretofore known as the Upper Peninsula County Engineers' Association at a recent meeting at Saulte Ste. Marie. The object of the association is to promote the construction of roads in the Upper Peninsula of Michigan. The organization will hold semi-annual meetings and the first election of officers will be held next spring.

The National Highway Protective Society reports that during the month of July, 36 persons were killed by automobiles in New York City, as compared to 24 for the corresponding month last year. Of the killed 19 were children. Street cars caused the death of 11, as compared with 5 for July, 1915, and wagons killed 3, a decrease of 3 over the month last year. On the streets and highways of New York State, outside of New York City, during the month 37 persons were killed by automobiles, 1 by trolley and 1 by wagon. The total killed by automobiles in the state, including New York City, for the month of July was 73, as compared with 59 during July, 1915. During the same period automobiles caused the death of 22 persons in New Jersey, a decrease of 6, as compared with the corresponding month last year. Street cars killed 1, and wagons 2, while 6 were killed at railroad grade crossings in New York State and 4 in New Jersey.

A Monument Marking the Northern Terminus of the Dixie Highway and dedicated to H. S. Earle, former State Highway Commissioner of Michigan, was recently unveiled at Mackinaw City. The ceremony took place at the close of the West Michigan Pike and the Northeastern Michigan Pike tours. The monument was built by George Adams, a farmer living near Mackinaw City. It is made of field stones and is 15 ft. high and 5½ ft. square at the base. On two of the sides are medallions bearing suitable inscriptions, while the other two sides bear the Michigan coat of arms. At the top is a metal disc upon which is inscribed, "Apex to the Dixie Highway." Below this is a group of electric light bulbs. Among the speakers at the ceremony were Herbert F. Baker, former Speaker of the Michigan House of Representatives; State Representative S. J. Smith, of Mackinaw City; Philip T. Colgrove, President of the Michigan State Good Roads Association and Vice President of the Dixie Highway Association; Frank F. Rogers, State Highway Commissioner of Michigan; H. S. Earle, E. N. Hines, Chairman of the Wayne County Road Commission, and others.

REPORTS

LYNN, MASSACHUSETTS. COMMISSIONER OF STREETS AND HIGHWAYS. Annual report for the year ending Dec. 31, 1915. Paper, 6x9 ins., 18 pp. and covers.

The subject-matter of this report consists principally of tabular statistics on the work performed by the Commissioner of Streets and Highways during 1915. A roster of the Street Department and a brief report on the general features of the work of the department are also included.

PHILADELPHIA, PENNSYLVANIA; CITY PARKS ASSOCIATION. Twenty-seventh Annual Report for the year 1915. Paper, 6x9 ins., 81 pp. and covers; illustrated, inset maps and plans.

In this report, which is the annual report of the Managers of the City Parks Association of Philadelphia to the members, is included much matter referring to the condition of the parks in Philadelphia, needed improvements, and recommendations for legislation and work to be done. Park improvement, the abolition of the smoke nuisance, the zone system, assessment of benefits, and sidewalk encroachments are among the subjects taken up. The report is illustrated by a number of excellent half-tone reproductions of photographs showing scenes in the parks and views on various streets. Several large plans of the city's parks and streets are printed as insets.

NEW PUBLICATIONS

SOUTH CAROLINA, DEPARTMENT OF AGRICULTURE, COMMERCE AND INDUSTRIES. "WASHINGTON-TO-ATLANTA HIGHWAY IN SOUTH CAROLINA." Paper, 6x9 ins., 32 pp. and covers.

This booklet comprises a route book of that portion of the Washington-to-Atlanta Highway in the State of South Carolina, a descriptive chapter entitled "Footprints of Great Armies," and the text of the South Carolina laws relating to motor vehicles. Besides descriptions of the route arranged in the usual route book style there are maps of the different sections on which are indicated railroads, hotels, town and county lines, and other matters of interest to motorists.

"GOOD ROADS FOR WISCONSIN." Vol. I, No. 1. Published by the Good Roads Association of Wisconsin, Madison, Wisconsin. Paper, 7½x10½ ins.; illustrated.

The first number of "Good Roads for Wisconsin," dated July, 1916, is a 16-page publication devoted principally to a description of the objects of the Good Roads Association of Wisconsin, by which it is published. It contains several articles urging the improvement of a system of trunk line roads throughout the state, and other matter dealing with road improvement in Wisconsin and elsewhere. Included in the illustrations are reproductions of portraits of the officers of the association and a map of Wisconsin showing a tentative trunk line system.

PERSONAL NOTES

Robert Caldwell has been appointed City Engineer of Richland Center, Wis. He was formerly City Engineer of Beloit, Wis.

Roy M. Green has been appointed Assistant Professor of Highway Engineering at the Agricultural and Mechanical College of Texas. Mr. Green is a graduate of the University of Nebraska, and has recently completed the graduate course in highway engineering at Columbia University, New York, N. Y. Since that time he has been employed as Testing Engineer and Superintendent of Pavement Construction with Clark E. Mickey, a consulting engineer of Lincoln, Neb.

T. K. Legare has been appointed City Engineer of Columbia, S. C., vice John McNeal, resigned. Mr. Legare was formerly Assistant City Engineer.

Charles D. Snead has been appointed Bridge Engineer of the Kentucky Department of Public Roads. He was formerly connected with the Virginia State Highway Commission as Bridge Engineer.

Pollock and Taber

Announcement has recently been made of the formation of the firm of Pollock & Taber, Consulting Engineers, with headquarters in the Park Row Building, New York, N. Y. The members of the firm are Clarence D. Pollock, M. Am. Soc. C. E., and George A. Taber, M. Am. Soc. C. E.

Mr. Pollock has had over twenty years' experience in paving work in New York City, Havana, Cuba, and San Antonio, Texas, and has also had a varied experience in sewerage and drainage work and as an expert in litigation. He has lately practiced as a consulting engineer in New York.

Mr. Taber has been engaged on water supply engineering for over fifteen years, having been in charge of the design, construction and maintenance work of the Department of Water Supply in various boroughs of New York City. He also served three years as Engineer-in-Charge of the main office of the Croton Aqueduct Commission. During his incumbency of the latter office, several large masonry dams were built on the Croton watershed. He has also had extensive experience in water power, fire protection, street cleaning, and sewage disposal work, and in the valuation of private water companies for municipal and state purposes. Mr. Taber will continue his connection with the Polytechnic Institute of Brooklyn, N. Y., as Consulting Professor of Sewage Disposal.

Both Mr. Pollock and Mr. Taber are graduates of the Massachusetts Institute of Technology, class of 1894.

NEWS NOTES

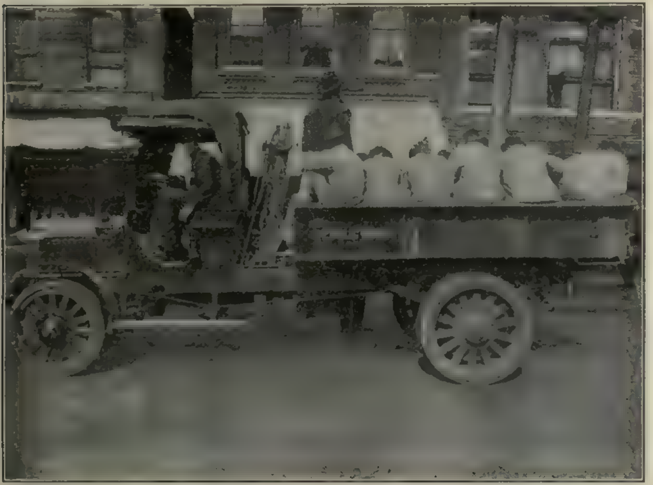
Data on the Observance of Pennsylvania's State-Wide Good Roads Day were printed in tabular form in the June-July issue of "Pennsylvania Highway News," the official publication of the Pennsylvania State Highway Department. The table is arranged by counties and shows, for both 1915 and 1916, the miles of road worked, the number of men working, the number of teams, and the number of drags. The totals are as follows: Miles of road worked, 6,007.75 in 1915, and 4,072.44 in 1916; men at work, 82,443 in 1915, and 42,969 in 1916; teams, 14,858 in 1915, and 5,869 in 1916; drags, 1,913 in 1915, and 1,121 in 1916.

The Value of the Street Maintenance Policy Adopted in Philadelphia, Pa., is being demonstrated this year, according to a recent statement by Chief William H. Connell of the Bureau of Highways and Street Cleaning of that city. Because of the conditions obtaining in the labor and material markets this season, work on which bids are being received is costing the city about 40 per cent. more than last year, it is stated, and, in fact, it is difficult to get work done at all. The contractors experience a great deal of trouble in securing laborers at any reasonable price and in obtaining materials, especially when shipped by water. Where the charges for such shipments were formerly 25 cts. per ton, according to Chief Connell, they are now a dollar or more. This state of affairs, it is stated, not only affects the contract work, but also the work done by the municipal forces. Up to the middle of August only about 60 per cent. of the bituminous surface treatment work on macadam country roads had been completed, while under normal conditions all of it would have been finished by the middle of July. In spite of these hindrances, it is stated, the highways are in good condition because of the careful maintenance work of the past.

EQUIPMENT — TRADE — MATERIALS

Motor Truck Used in Highway Work in Covington, Kentucky

A truck used for various purposes in connection with highway work in the City of Covington, Kentucky, is shown in the accompanying illustration.



TRUCK MADE BY THE UNITED STATES MOTOR TRUCK CO. IN USE IN COVINGTON, KY.

The particular use illustrated is the carrying of prisoners to the city quarries. Every morning at half-past six a similar load is carried from the city workhouse to the quarries, where the prisoners are left for the day's work, and the machine returns with a load of stone which is carried to street jobs in the city. On arrival at the work the stone is unloaded, the truck being equipped with a spreading device which saves labor in the distribution of the material.

At present a schedule is being worked out for utilizing the truck to haul wagons of refuse to the city crematory. In the winter it will be used in snow removal work.

The machine is a 5-ton "U. S." motor truck, equipped with a steel body with adjustable sides and seats for the accommodation of the prisoners. It is also equipped with a hydraulic hoist and spreading device, as previously noted. It is manufactured by the United States Motor Truck Co., of Cincinnati, Ohio.

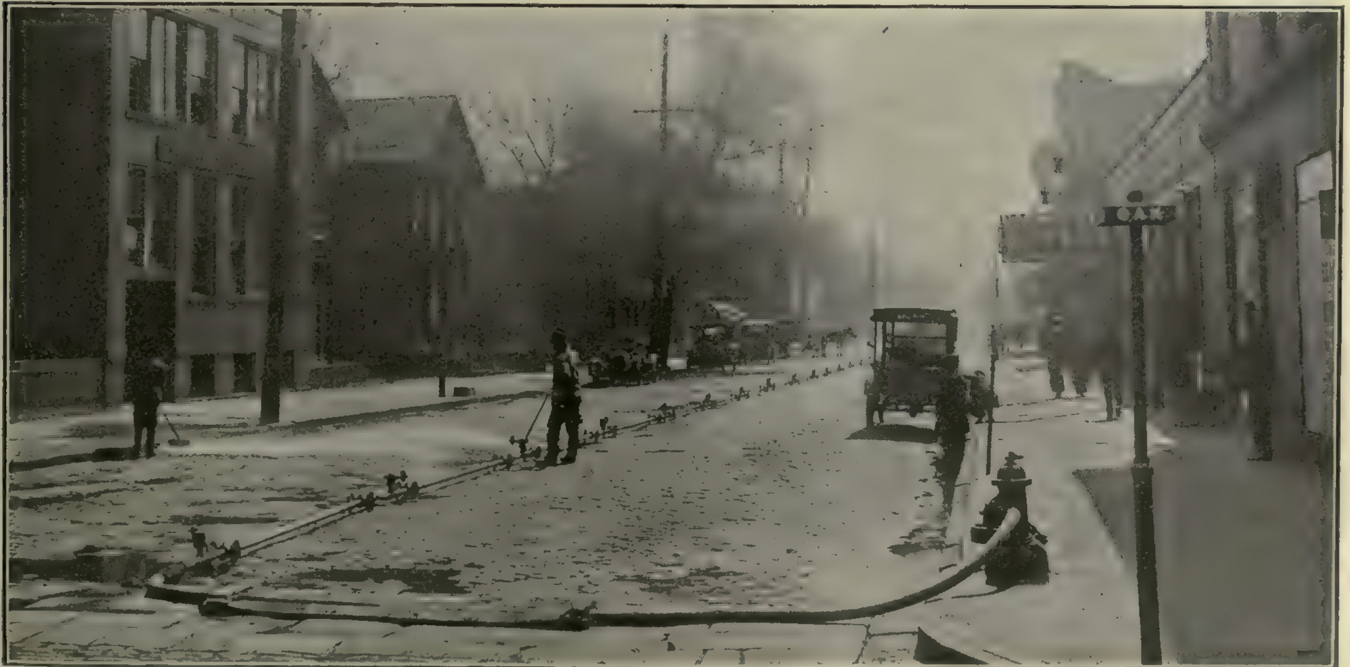
Portable Pipe Line Street Flusher

A novel device for flushing pavements consists of a sectional pipe line mounted on wheels and equipped with nozzles and a hose for connection with a hydrant.

Each section, or unit, consists of a 15-ft. length of galvanized wrought iron pipe, with nozzle and connections, mounted on four wheels, two near each end. The wheels are of iron and are 8 ins. in diameter. The nozzle is mounted pivotally and set horizontally at a height of 10 ins. above the pavements. The nozzle is controlled by means of an operator's handle, as shown in the illustration, and can be turned through 360 degrees if desired. The units are connected by 1-ft. lengths of 2-in. flexible hose, and the proper couplings. The end unit in the line is connected with a hydrant by a hydrant hose coupled to the 1-ft. length of connecting hose.

The number of units required for a set, in other words, the length of the line, is determined by the average distance between hydrants. One-half of this distance is recommended by the manufacturers. For example, if the hydrants average about 400 ft. apart, the length of line should be about 200 ft. and 12 or 13 units would be required.

At the beginning of a day's work, the separate units are loaded on a wagon or truck and enough to make up a set are unloaded and set up at the starting point of flushing operations. On streets carrying car tracks the line is set up at a safe distance from the outer rail; on streets without tracks the line is set up along the center. The use of the device does not interfere with traffic as protecting boards are



"B. M. E." PORTABLE PIPE LINE PAVEMENT FLUSHER IN OPERATION.

used at the hydrant hose as shown in the illustration. In flushing the pavement the operator begins at the higher end of the line and works toward the lower, using each successive nozzle to clean the area to the next one, flushing the area on one side of the line and then on the other. When the entire area covered by the line has been cleaned, the hydrant hose is disconnected, the whole line moved along to the next hydrant, and the operation repeated. The flexible hose connections between adjacent units permit turning corners. At the end of a day's work the units are disconnected, loaded into the wagons and carried back to the storage yard or shed.

Among the advantages claimed for the device are ease of operation, low first cost and durability. It is claimed that 240 ft. of street can be flushed in from 5 to 7 minutes.

The device is known as the "B. M. E." portable pipe line pavement flusher and is manufactured by the Buffalo Municipal Equipment Co., of Buffalo, N. Y.

American-Made Concrete Mixer in Operation on Street Work in Hilo, Hawaii

Notwithstanding the cheapness of labor and the high cost of importing labor saving machinery, such equipment is not infrequently utilized in the more progressive tropical countries. An instance of this is furnished by recent street work in Hilo, Hawaii, which is illustrated herewith.

LAYING A CONCRETE PAVEMENT ON FRONT ST., HILO, HAWAII, WITH A CHAIN BELT MIXER.

Some weeks ago a concrete mixer purchased by the road department was received at Hilo. Soon afterwards it was set up on Front street, where a concrete pavement was being built. The machine is a Chain Belt Mixer of 14 cu. ft. capacity, and was purchased of the A. L. Young Machinery Co., of San Francisco, Cal., through the Honolulu Iron Works. According to a report published in a local paper soon after the installation of the mixer, its use had already greatly accelerated the work, although because of the inexperience of the workmen it had not then been operated at its full capacity. It was expected, however, that within a couple of weeks from 175 to 225 lin. ft. of 20-ft pavement would be put down daily.

The mixer is one of the line manufactured by the Chain Belt Co., of Milwaukee, Wis. Since the publication of the article referred to, the company has sold two more mixers for use in Hawaii, one equipped with a steam power plant and the other with a gasoline motor. Each is equipped with a 20-ft delivery boom and bucket.

Cement Concrete Road and Street Contracts Awarded

According to figures recently supplied by the Road Bureau of the Portland Cement Association, contracts for upward of 1,000,000 sq. yds. of concrete pavement have been awarded this year in five states.

The states referred to and the yardages awarded in each are as follows: Illinois, 1,412,789; Ohio, 1,391,430; Indiana, 1,342,095; New York, 1,150,304; Iowa, 1,000,291.

In each of four other states contracts amounting to about a half million square yards have been awarded as follows: Michigan, 606,113; Wisconsin, 546,203; California, 448,749; Texas, 530,470. It should be noted in this connection that the California records were not complete when the figures were made up.

It is further stated that most of the yardage in Iowa is for city streets, while the majority of the work in other states is on country roads.

NEWS NOTES

The Solution of the Road Building Problem of Wisconsin, as set forth by the Good Roads Association of Wisconsin in its publication, "Good Roads For Wisconsin," consists of bringing about the enactment of a law empowering the State Highway Commission to lay out a proposed system of trunk lines in the state. The units of this system, according to the association's plan, would be certain main highways traversing each county. It is further suggested that the building of these roads be financed jointly by the state and the counties, the state to pay two-thirds the cost of construction. It is also proposed that the construction of the roads be subject to the approval of the State Highway Commission.

Planning Problems in the Smaller Cities are very similar to those of larger cities except that the former are in a better position to avoid many of the evil results of the lack of proper planning in the early days of cities that have become large, according to John Nolen, of Cambridge, Mass., in a paper presented at the Cleveland meeting if the National Conference on City Planning. Some of the chief shortcomings of large cities, from the city planning point of view, are given by Mr. Nolen as follows: "(1) Inadequate systems of arterial streets, including with them a proper consideration of transit problems. (2) The neglect of the regulation of city building according to districts, defining the use of various areas, with the regulation of height of buildings, percentage of lot to be covered, etc. (3) The postponement until it is too late of the reservation of ample lands for park systems and local recreation grounds. (4) The failure to recognize early the advantages, from many points of view, of an orderly grouping of public buildings, conveniently and appropriately located. (5) A neglect of that kind of city planning which will give unity and character to the city as a whole, and enable it better to discharge its functions."

Six Miles of Plank Roadway Across a California Desert is to be included in the highway system of that state. The road is located in a section of desert through which travel is difficult because of slowly but constantly shifting hills of extremely fine sand. The wooden sections are each 8 ft. wide, 12 ft. long and weigh about 1,500 lbs. A section consists of three longitudinal stringers upon which are spiked 4-in. planks. The spikes are kept from working out by three ¼-in. steel bands, 1½ ins. wide, running longitudinally and covering the heads of the spikes. These strips are fastened to the planks and stringers at 2-ft. intervals by means of carriage bolts. The sections are laid with a wooden frame traveling crane, which is moved along as the units are laid. As each section is put down, the stringers are worked into the loose sand, previously leveled up, until the planks come to a bearing. The sections are then connected by means of straps and bolts. When the plank roadway is laid, sand shoulders 4 or 5 ft. wide are built at the sides and the full width of plank and shoulders covered with hot road oil. Gravel or coarse sand is then spread over the surface. A second application of oil and sand is made on the planks. The sections are built at a central yard and hauled to the work by teams.

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GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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NEW YORK, SEPTEMBER 9, 1916

Number 11

Planning for Bridge Across James River at Richmond, Virginia

The City Council of Richmond, Va., is to be asked for a bridge across the James River to connect the north and south sides of the city. A bond issue to defray the cost is a part of the project.

Preliminary plans have been prepared at the instance of those favoring the bridge. These call for a concrete structure about 5,500 ft. long, from Laurel Street to Cowardin Avenue, the cost of which is estimated at about $300,000.

Forty-Seven Miles of Asphalt Road Planned in Polk County, Florida

The Winter Haven section of Polk County, Fla., plans to form a special road and bridge district and build 47 miles of sheet asphalt roads for which surveys have already been started.

It is planned to meet the cost of construction by means of a bond issue of $300,000 to be voted on in the near future. As about 75 per cent. of the voters signed the petition for the bond issue, there appears to be little doubt that the election will carry.

Alliance, Ohio, Will Work Petty Offenders on City Streets

Able-bodied men arrested for intoxication and petty offences and who are unable to pay the fines imposed will hereafter be put at work on the city streets in Alliance, O.

There has been some difficulty in securing enough men for street work in Alliance during the present season and this plan has been worked out by Mayor Westover and Service Director McCannell to fill the double purpose of providing street laborers and relieving the city of the necessity of paying an offender's board at the workhouse.

Lorain, O., is working under a similar plan, as noted in "Good Roads" for June 17.

State of Ohio Receives Bids for Road and Bridge Construction

Low bids amounting to $273,004.74 for road and bridge construction were received recently by the State Highway Department of Ohio.

The work involves the building of 21.26 miles of highway, and one concrete girder bridge, in eight counties. Details of the bids are given below.

Coshocton County, Walhonding-Newark Road, 2.37 miles water bound and surface treated macadam, Lee, Griggs & Andrew, Millersburg, $8,518.70.

Cuyahoga County, Cleveland-Sandusky Road, 5.34 miles brick, Elyria Construction Co., Elyria, $157,836.25; bituminous concrete and hillside brick, Pace Bros., Cleveland, $157,402.60; bitulithic and hillside brick, Johnson Construction Co., Chicago, Ill., $159,007.60.

Erie County, Columbus-Sandusky Road, 4 miles water bound macadam, Buckeye Engineering Co., Norwalk, $37,034.94.

Highland County, Milford-Hillsboro Road, 0.41 mile water bound macadam, Basil Lunsford, Pedro, $1,400; West Union-Belfast Road, 1.75 mile water bound macadam, Bear & Co., Highland, $7,303.

Jackson County, Jackson-Ironton Road, 1.08 mile brick, Charles and George P. Mahl, Ironton, $29,061.25.

Knox County, Columbus-Wooster Road, constructing new concrete girder bridge over Dry Run, Lewis Pickering, Bellefontaine, $2,200.

Pickaway County, Circleville-Adelphi Road, 5.1 miles water bound gravel, Wesley E. Justus, Circleville, $17,662.60.

Seneca County, Lima-Sandusky Road, 1.20 mile water bound macadam and concrete, George Sproul and J. H. Murphy, Burgoon, $11,988.

District of Columbia Motorists May Now Use Virginia Roads

As a result of a recent conference between Governor Stuart of Virginia, officers of the American Automobile Association and others, motor vehicles bearing a District of Columbia license will be permitted the use of Virginia roads until further notice.

Prior to the conference, officials of Alexandria County, Va., had been arresting motorists from the District of Columbia unless the vehicles were provided with a Virginia license. There is now under consideration a plan to establish reciprocal relations between the state and the district.

Motorists in the District of Columbia are interested in a movement to build a modern motor highway from Washington, D. C., to Richmond, Va. It is understood that liberal subscriptions are being made to a fund which has been established for this purpose.

Excellent Progress Being Made on the Toronto-Hamilton Highway

Only about nine miles of road remains to be completed on the Toronto-Hamilton Highway in Ontario, Canada.

Toronto and Hamilton, the former with a population of 500,000 and the latter with 100,000, are about 40 miles apart. The highway which joins them is part of the main route through Ontario connecting Ottawa and Montreal on the east and Windsor and Sarnia on the west, and serving the oldest and most populous districts of the province.

In order to construct and maintain a permanent highway between the two cities, the Toronto-Hamilton Highway Commission was appointed in September, 1914, with George H. Gooderham as chairman. In November, H. D. Van Scoyoc, of Toronto, was appointed chief engineer, and during the same month work was begun. Preliminary surveys had already been made under the direction of Deputy Minister of Highways W. A. McLean, who was at that time Chief Engineer of Highways of the Ontario Department of Public Works.

In the beginning, the estimated cost of the work was $600,000, of which Toronto was to pay $150,000, Hamilton $30,000 and the provincial government and the municipalities served each $4,000 per mile. In April of this year the revised estimates placed the total cost of $920,000, and $100,000 of the additional amount was added to Toronto's share, and $20,000 to Hamilton's share. This $920,000 does not include the cost of bridges which will have to be erected.

It was decided to build the road of concrete, the paved portion to be 18 ft. in width, 8¼ ins. in thickness at the center, and 6 ins. in thickness at the sides. By special arrangement with the commission some of the municipalities are building roads of different widths. The town of Oakville, for instance, has paved the road to a width of 50 ft. between curbs. On most of the road a concrete pavement is being placed in the center of the right of way with a 3-ft. earth shoulder and an open ditch on either side. The maximum grade is 4 per cent. and the minimum radius of curvature 200 ft.

Work on the road has been carried on simultaneously at various points. The 30 miles between Hamilton and Etobicoke is within a month or two of completion, only a little over 4 miles remaining to be laid. Work on the 5-mile section nearest Toronto, between Etobicoke and the Humber River, has not been started. The delay on this section has been caused by the installation of a sewerage system at New Toronto, a suburb of Toronto on the line of the roadway. It is stated that after the completion of this sewerage work, the road could be completed in something over a month. It is expected, however, that the completion of the road will be deferred until next spring.

Plans for San Francisco-Oakland Bridge Considered by Army Engineers

Plans for the proposed bridge between San Francisco and Oakland, Cal., mention of which has been made in previous issues of "Good Roads," were considered at a recent public hearing in San Francisco before a board of army engineers, composed of Col. Thomas H. Rees, Col. Charles L. Potter and Maj. George B. Pillsbury.

Three plans were discussed at this hearing, the first being that of the associated bridge engineers, Wilbur J. Watson & Co., Cleveland, O., William R. Davis, Albany, N. Y., and Harlan D. Miller, also of Albany. The bridge contemplated in this plan would extend from Second to Townsend Sts., San Francisco, to First and Adeline Sts., Oakland. There would be steel spans of 200 and 250 ft., with clearances of from 20 to 90 ft., including a bascule span with 200-ft. waterway. The estimated cost of this structure is $23,000,000 and it is planned to issue bonds for the amount against a bridge district composed of San Francisco, Oakland, Alameda, Berkeley and adjacent towns. The bridge traffic would yield a revenue which, it is believed, would pay the cost of construction in about 25 years.

The second plan considered was that of Charles E. Fowler of Seattle, Wash. This contemplates a cantilever bridge with three 2,000-ft. spans, 150 ft. high, from Oakland to Goat Island, and 2,950 ft. of steel spans, including an 800-ft. cantilever span from Goat Island to Telegraph Hill, San Francisco. The cost is estimated at $75,000,000, which, according to the plan, would be met by a private corporation which would take over the transbay transportation system and charge a 5-ct. rate for street car and bridge travel.

Allen C. Rush of Los Angeles, Cal., proposed a suspension bridge 180 ft. high, with 2,000-ft. spans from the Alameda shore to Rincon Hill, San Francisco. Oakland and San Francisco would donate terminals and secure two-thirds of the bridge stock. The estimated cost under this plan is $32,000,000.

A final hearing was held later at Los Angeles, Cal., at which other plans were presented, including a pontoon bridge, a combination bridge and tube and several types of tunnels.

The board of engineer officers will send the data obtained to the War Department at Washington for final decision as to the feasibility of the plans presented.

Los Angeles, California, to Clean Streets by Vacuum Method

The Board of Public Works of Los Angeles, Cal., has awarded a three-year contract for cleaning the city streets by the vacuum method. The contract price is 10.5 cts. per 1,000 sq. yds.

The vacuum method was adopted after a test showed that the use of flushers would cost at least 13.26 cts. per 1,000 sq. yds., under the most favorable conditions and that the average would be somewhat higher than that figure.

Lima, Peru, Automobilists Organize to Secure Better Roads

A number of automobilists of Lima, Peru, have formed a club with the immediate object of securing better motoring conditions in Peru.

According to a consular report, the streets of Lima are narrow and rough and the surrounding country is practically without roads.

A member of the new club has offered to construct an avenue 100 ft. wide through his own properties, thus completing a 10-mile loop from Lima to the sea at Magdalena and back by way of Miraflores.

Iowa Counties Get Second Distribution of Automobile License Funds

The second distribution of road funds derived from motor vehicle license fees was made to Iowa counties during August. The amount was approximately $250,000, making a total of $1,407,138 distributed since the first of the year.

On August 1 the total registration of motor vehicles in Iowa was 176,000. The license funds are prorated among the counties according to the number of townships in each. Five per cent. of the funds is retained by the state as the cost of collection and administration and another five per cent. goes to the maintenance fund of the State Highway Commission.

Plan to Connect Klamath County, Oregon, with the Coast

The construction of a highway from Klamath Falls, Ore., through Eugene to Florence, Ore., is being urged by the three cities and by individuals along the proposed route. The plan contemplates federal aid.

At present Klamath County, in which Klamath Falls is located, has practically no trade outlet except into California. So much of the county is included in national park, Indian, forest, bird and other reservations, that less than 17 per cent. is listed on the tax rolls. The proposed road would connect the county with other places in Oregon and provide an outlet to the coast.

Plans for Repaving Brooklyn Bridge Call for Wood Block Pavement

Bridge Commissioner F. J. H. Kracke has asked the Board of Estimate and Apportionment of New York City for an appropriation of $70,000 for repaving the roadway of the Brooklyn Bridge, between the Boroughs of Manhattan and Brooklyn, New York City.

Commissioner Kracke is reported as having stated that the present plank roadways have cost the city $750,000 for repairs since 1883. The plans for repaving call for wood block pavement. About 150 ft. of this pavement was laid on the Brooklyn side of the bridge in 1914 as an experiment, and is said to have proven satisfactory. The appropriation asked for would be sufficient, it is stated, to construct a new floor and lay the wood block pavement.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

REMOVING ADVERTISING SIGNS ON NEW YORK HIGHWAYS

Acting under the authority of a section of the Penal Law of New York, State Highway Commissioner Edwin Duffey has issued orders for the removal of all advertising signs within the bounds of the public highways under his jurisdiction. If owners of the signs fail to comply with the order, the signs will be removed by the department.

This undertaking of the New York State Highway Department merits commendation and will doubtless meet with the hearty approval of everyone except the owners of the signs. It is a matter of regret that the department's activity can not be extended to signs that are erected to be read from the road but are not actually within the right of way. Roadside advertising signs have multiplied rapidly with the increase of automobile traffic and in many places have become nuisances. Among the many effects of the motor-driven vehicle has been the awakening of the public to the scenic beauties of the country roads, and probably nothing has detracted so much from the scenery as has the practice of erecting advertising signs along the roads.

About six years ago an active campaign against advertising signs in and along the highways was carried on by the Automobile Club of America. Encouraged by the passage of a law providing that an advertisement erected upon the public highway in violation of the provisions of the law might be removed or destroyed by anyone. September 1, 1911, was designated by the organization as "Clean-Up Day," and requests were sent out to automobile organizations throughout New York State to organize for the destruction of all illegal signs. There is no information at hand to show how effective "clean-up day" was at that time, but the recent order by Commissioner Duffey indicates that better conditions may be looked for in the near future.

The Authorities of Beloit, Wisconsin, Suspend Paving for a Year

It has been decided by the authorities of Beloit, Wis., to suspend all important paving operations for one year. Therefore, only such work as is absolutely necessary will be done during 1917.

There has been considerable delay during the past two years owing to the fact that subsurface work has not been completed in time to permit paving operations to start according to schedule.

The intention is to prepare a list of streets to be paved during the coming winter. Then next year will be devoted to the work of getting sewers, water mains and other underground structures completed so that there will be no cause for delay when paving is started in 1918.

COMING MEETINGS

September 13-14—New York State Association of County Superintendents of Highways—Meeting, Syracuse, N. Y. Chairman, Executive Committee, George S. Tibbits, Oneida, N. Y.

September 14-16—Washington State Association of County Commissioners—Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

September 26-28—League of Virginia Municipalities—Annual meeting, Clifton Forge, Va. Secretary, Luther C. Brinson, Portsmouth, Va.

October 6—National Paving Brick Manufacturers' Association.—Conference, Terre Haute, Ind. Secretary, Will P. Blair, B. of L. E. Building, Cleveland, O.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

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October 13-14—Society for Street Cleaning and Refuse Disposal.—Annual meeting, New York, N. Y. Secretary, Joseph R. Buchanan, Municipal Building, New York, N. Y.

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November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

Good Roads Day at Reading, Pennsylvania, Fair

September 12 has been designated as "Good Roads Day" by the managers of the Reading Fair, which is to be held at Reading, Pa., September 12 to 15. Arrangements for the observance of the day are in charge of Harvey F. Heinly, of Reading, former District Attorney of Berks County and an active supporter of the good roads movement.

An exhibition of road building machinery and materials has been arranged as well as an exhibit by the Pennsylvania

State Highway Department. It is planned also to have a demonstration of road building.

Governor Brumbaugh and State Highway Commissioner Black of Pennsylvania have been invited to be present and the township supervisors of Berks County and the members of council of all the boroughs are expected to attend.

New York State County Highway Superintendents

The program for the meeting of the New York State Association of County Superintendents of Highways, which will be held in the Onondaga County Court House, Syracuse, N. Y., September 13 and 14, has been completed and consists principally of discussions of topics of interest to the association.

At the session on September 13, the meeting will be called to order by the president, James F. Loughran. The first discussion will be led by Henry S. Ball, Watertown, N. Y., and the subject will be "Taking the Office of Town Superintendent Out of Politics, Lengthening the Term of Service and Making Removal a More Simple Matter."

Other discussions at this session and the names of those who will lead them are: "Uniform Prices of Machinery," O. C. Richards, Hudson Falls; "The Use of the Automobile License Fees in County Road or Town Highway Construction," Charles Van Amberg, Binghamton; "The County as a Unit in the Administration of Highway Affiairs," George C. Diehl, Buffalo.

Following a short business session on September 14, there will be these discussions: "County Road Construction and Maintenance," J. C. Dayton, Auburn; "Is It Advisable to Increase the Carrying Capacity of New Steel and Concrete Bridges?" Calvin T. Anderson, Stony Point; "The Class of Road or Pavement Which Will Be Most Advantageous to the Towns and Counties," Frank E. Bogardus, Syracuse.

Toward the close of the session there will be remarks by B. J. Rice, Third Deputy Commissioner, New York State Commission of Highways.

Washington County Commissioners and Engineers

The annual meetings of the Washington State Association of County Commissioners and the Washington State Association of County Engineers will be held at Tacoma, Wash., on Thursday, Friday, Saturday and Sunday of next week. Governor Lister of Washington will deliver an address of welcome to the two associations on Thursday afternoon, after which each organization will proceed with its own meeting.

The program for the county commissioners' meeting contains the following papers: "Highway Bridges," Dean A. H. Fuller, College of Engineering, University of Washington; "Location and Construction of State Roads, also Relation of Highway Commissioner's Office with County Commissioners in Matter of Permanent Highway Law," James Allen, Washington State Highway Commissioner; "California State Highway Work," Clarence B. Osborne, Chief Geologist, California State Highway Commission, the paper being prepared in collaboration with Austin B. Fletcher, California State Highway Engineer; "Highways of the State of Oregon—Laws, Construction and Maintenance," John H. Lewis, Chief Engineer, Oregon State Highway Commission; "Maintenance of Earth and Gravelled Roads," Prof. William A. Allison, University of Washington; "Experience and Views on Earth and Gravelled Road Construction," Oscar Rohn, Butte, Mont.; "Landscape Improvement of Highways," J. E. Gould, M.A., University of Washington.

The following papers are included in the program of the county engineers' meeting: "Pierce County Pavements," David H. White, County Engineer, Pierce County, Wash.; "The Condemnation of Rights of Way for County Highway Purposes," Edwin C. Ewing, Deputy Prosecuting Attorney, King County; "Cheaper Roads," H. A. Sewell, County Engineer, Pend Oreille County; "The Snoqualmie River Bridge," Charles D. Calley, Bridge Engineer, King County; "The Economic Location of Highways," Thomas R. Beeman, Division Engineer, King County; "The Contractor's Viewpoint," George M. Savage, President, Washington Paving Co.; "The Value of an Adequate Highway System as a Military Adjunct," Capt. Arthur P. S. Hyde, C. A. C.

There will be a joint meeting of the two associations on Friday morning, when papers will be read by Dr. H. K. Benson, Professor of Industrial Chemistry, University of Washington, on "Experimental Research as Applied to Paving Materials," and R. H. Thomson, consulting engineer, Seattle, Wash., on "Country Pavements."

Thursday evening the members of both organizations will attend the theater, Friday afternoon will be spent at the Western Washington Fair, Puyallup, Wash., Saturday evening a banquet will be held at the Elks' Temple and all day Sunday will be devoted to an automobile trip to Mt. Tacoma.

The fourth annual convention of the League of Texas Municipalities will be held at Hillsboro, Tex., on October 26, 27 and 28. The program which is in course of preparation will embrace a wide range of municipal problems. Prof. H. G. James, Austin, Tex., is Secretary-Treasurer of the organization.

PERSONAL NOTES

C. D. Peacock has resigned as City Engineer of Brainerd, Minn.

Hugh Murphy, a paving contractor of Omaha, Neb., died recently at Old Orchard, Me.

L. A. Granger, Assistant City Engineer of Fresno, Cal., has resigned to engage in private practice.

Louis Knudson has been appointed City Engineer of Brainerd, Minn., succeeding C. D. Peacock, whose resignation is noted elsewhere in this column.

L. L. Coleman, City Engineer of Maricopa, Cal., since its incorporation, died recently of uremic poisoning, following an operation for appendicitis.

J. K. McGrath has been appointed Engineer in charge of road work in Fayette County, W. Va. He was formerly Assistant Engineer in charge of paving in Baltimore, Md.

NEWS OF THE TRADE

The Koehring Machine Co., Milwaukee, Wis., has recently issued the August-September number of "The Koehring Mixer," the company's house organ. This publication is always interesting and exceptionally well printed.

In the September issue of "Like KELLY Does," the house publication of the Kelly-Springfield Motor Truck Co., Springfield, O., is an illustrated article describing the service of Kelly-Springfield motor trucks with the army on the Mexican border.

The Committee on Patents of the United States Senate, which was directed at the last session of Congress to ascertain whether patents were fraudulently issued to Daniel B. Luten on concrete bridges, has reported, submitting to the Senate a letter from the United States Patent Office stating that careful scrutiny of the records fails to reveal any indication of fraud in connection with the issuance of the patents.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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NEW YORK, SEPTEMBER 16, 1916

Number 12

Discussion of the Federal Aid Bill From the Standpoint of the States*

By C. B. SCOTT†

The principal reasons for the national government's aiding the states in the construction of improved highways are:

First: The fact that interstate travel has increased to such an extent in recent years that an undue and improper burden has been placed upon some states by reason of the traffic passing through them to other states. It may be that a road which is of slight importance to the state through which it passes forms a link in an important interstate highway. The state through which such a road passes has little inducement to improve it and yet if it is not improved it may hinder intercourse between a number of other states.

Second: The necessity for constructing adequate highways for the transportation of military forces, equipment and supplies, such highways being sometimes of small consequence to the states in which they are located, but of supreme importance to the country as a whole.

Third: The fact that the federal government has sources of revenue independent of the states, which should justly be required to contribute to the improvement of interstate highways.

Fourth: The advantage to the federal government, from a political standpoint, in facilitating intercourse between the people of the different states, thus preventing sectional jealousies and prejudices which, if carried on to an extreme, might seriously hamper the progress and safety of the whole nation.

Among the advantages to the states from cooperation by the federal government in the improvement of the public highways we may consider:

The inducement, and I might almost say the requirement that the states shall all establish highway departments and thus handle the work of road improvement, in a scientific and systematic manner.

More frequent opportunities for consultation on the part of members of the state highway departments and members of the government Office of Public Roads, by means of which the highway department of one state will have the advantage of the experiments and experience of highway departments in other states gathered by the Office of Public Roads.

The advantage of observation of the methods of the trained and experienced employes of the Office of Public Roads and the object lessons of proper construction of roads and bridges built with federal aid. It should be the endeavor of the Office of Public Roads to attract men of thorough training and practical experience in order that it may have more such men to represent it rather than mere theorists who are almost wholly lacking in that knowledge of the fundamental principles of engineering, as well as a proper regard for the rights and opinions of others which are the foundation upon which successful cooperation is based.

The advantages from federal aid, if properly handled, should far outweigh its disadvantages, but we should not be blind to the fact that there may be disadvantages and possible dangers in such a system and that only by intelligent and efficient management can the disadvantages and the dangers be avoided.

If expensive and unnecessary requirements are made on the part of the federal government with regard to methods of surveying the roads proposed to be constructed and as to the form, details and number of maps, plans and estimates required of the states, the expense to the states will be so heavy as to be burdensome and may even result in some of the poorer states failing to avail themselves of their allotment under the act. The requirements on the part of the government in this respect should be the least that good practice and proper regard for accuracy will permit.

Unnecessarily expensive and wasteful methods of construction should be avoided by the federal government, as the benefit derived from the federal appropriation will otherwise be minimized and if the methods are too costly, the states can better afford to do without the federal aid and build such roads as their own resources will permit. The states, on the other hand, should not expect to do work of an inferior or temporary nature with federal aid, but the roads constructed by this means should be of a substantial and durable character.

The people of all of the states are interested in the expenditure of the federal appropriation in every state and it should first be applied to interstate highways or very important main highways of a state, and no part of it should be used in the construction of roads which are only of local or state importance.

One of the greatest dangers in the federal government's embarking in a system of internal improvement of such an extensive and costly character, is that politicians who are willing to sacrifice the welfare of the nation for their personal advantage may attempt to use the federal appropriations as a means of obtaining political support. This is very well prevented at present by the requirement that the state shall contribute an equal amount to that appropriated by the federal government; for the states will not be active in attempting to secure excessive appropriations when they have to contribute an equal amount and they will have such an interest in the work as will make them wish to see the funds properly expended. Everyone who hopes to see the construction of interstate roads under this act made a success and who puts the welfare of the nation before a selfish desire for the prosperity of his immediate community or state, should be ever on the watch to see that no future congress does away with this requirement.

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*Paper presented at the meeting of the Southern Appalachian Good Roads Association, Lexington, Ky., September 4-8.

†Assistant Commissioner, Virginia State Highway Commission.

Those in charge of administration on the part of the federal government should endeavor to adapt their methods and requirements to local conditions as far as circumstances require and proper construction will permit and give due credit to the state and local road authorities for their experience and familiarity with local conditions. They should not assume an attitude of superiority, although in some cases they may have a broader outlook and may be better informed. The state and local road authorities should avoid jealousy and antagonism toward employes of the federal Office of Public Roads and recognize and give due credit to those who possess accurate information and have had a varied experience.

In the expenditure of federal aid, the benefit to the country as a whole should be the matter of first consideration and every one connected with the work should make a patriotic effort to contribute to the success of the undertaking.

New Law Gives Augusta, Georgia, Council Wide Powers in Paving Matters

A new law gives the City Council of Augusta, Ga., wide authority in the matter of ordering street paving and repairs and the assessment of costs.

It is provided that by a two-thirds vote, the council shall have full power and authority to order the grading, paving or repair of any streets or alleys and to assess two-thirds of the cost against abutting property, the city paying the balance.

In the case of streets or alleys in which railway tracks have been laid, the council is authorized to assess the cost of the improvement between the rails and for three feet on each side of the tracks against the railway company and to deduct this portion from the total cost.

Increased Allowance for Surburban Roads in District of Columbia

The District of Columbia appropriation bill recently signed by the President carries an item of $440,160 for the improvement of suburban roads, which is approximately $200,000 more than the sum allowed last year.

Included in the proposed work to be done under the appropriation are four arterial developments, Rhode Island Avenue from South Dakota Avenue to the district line, New Hampshire Avenue from Grant Circle to Concord Avenue, 16th Street from Montague Street to Alaska Avenue, Massachusetts Avenue from Nebraska Avenue to the district line.

For the paving of streets within the limits of the City of Washington, the bill carries an approoapriation of $310,000. Among the improvements to be made under this item are the paving of 7th Street from R Street to Florida Avenue and the widening to 70 ft. of 14th Street from F Street to Pennsylvania Avenue. The present width is 46 ft.

The bill also carries an appropriation of $6,000 for the preparation of plans for a new bridge over Rock Creek at Calvert Street and provides for an increase of 25 cents a day in the pay of street cleaners.

Brick or Concrete Recommended for Streets of Berkeley, California

In his report for 1915-1916, Commissioner of Public Works F. T. Robson, of Berkeley, Cal., states that most of the streets in what is known as the hillside district of the city, will require repaving in the near future. This district embraces most of the high value residence property and the commissioner recommends the use of either plain concrete or brick pavements. The Department of Public Works has prepared alternative plans involving the use of these materials.

The report states that Berkeley, with a population of about 70,000, has a street mileage more than one-third that of the Borough of Manhattan, New York, N. Y. About 95 per cent. of the streets are paved with macadam and the remainder with asphalt. There are approximately 140 miles of macadam streets of which 75 per cent. is more than ten years old and 15 per cent. is more than twenty years old.

The allowance for street repair during the period covered by the report was $30,000. Although this is said to be the largest sum ever allowed for the purpose, the report states that it was insufficient for the proper maintenance of the macadam streets.

Nearly 100 Miles of Pavements Laid by 33 Cities in Texas

A recently completed compilation of paving statistics shows that in 33 Texas cities there were laid 1,872,656.72 sq. yds., or 94.970 miles of pavements during the year from January 1 to December 31, 1915.

The names of the cities and the area of paving done in each are given in the following table:

City	Square Yards
San Antonio	703,365.96
Dallas	155,782.92
Temple	125,440.53
Fort Worth	79,285.00
Mineral Wells	74,458.00
Paris	62,876.41
Houston	61,437.88
Sulphur Springs	60,072.47
Galveston	40,232.15
Waco	39,288.77
El Paso	38,437.00
Arlington	37,391.00
McKinney	36,325.00
Yoakum	36,297.00
Corsicana	34,484.40
Denison	33,651.00
Corpus Christi	32,953.63
Ennis	27,965.00
Wichita Falls	27,544.80
Terrell	27,000.00
Marshall	22,616.60
Austin	19,025.80
Abilene	15,860.80
Lufkin	14,044.00
Mt. Pleasant	13,480.00
Vernon	12,562.00
Bryan	11,231.00
Hillsboro	9,155.00
Sweetwater	7,956.00
Greenville	7,220.20
San Angelo	2,028.00
Texarkana	1,689.00
Highland Park	1,499.00
Total	1,872,656.72

The various types of pavement used with the square yardage of each are shown below.

Kind of Pavement	Square Yards
Asphaltic concrete	352,611.53
Bitulithic	337,413.18
Vertical fiber brick	293,527.85
Creosoted wood block	211,561.20
Asphalt macadam	148,433.80
Uvalde rock asphalt	107,649.73
Plain concrete (one course)	90,182.20
R. F. concrete (two course)	87,556.50
Oklahoma rock asphalt	76,334.60
Granitoid	54,639.10
R. F. concrete (one course)	22,829.00
Plain concrete (two course)	45,315.00
Standard brick block	24,353.00
Vibrolithic	8,206.00
Sheet asphalt	5,986.00
Other kinds	6,154.63
Total	1,872,656.72

The Plan of the Highway Commission of Humboldt County, Cal., to issue $1,500,000 bonds for the construction of roads was defeated at the recent primary elections.

The Board of County Commissioners of Hamilton County, O., has decided to discontinue the use of macadam for permanent road improvements. It is stated that county roads will hereafter be built of brick or concrete.

Customs Records on the Pacific Highway at the boundary between the State of Washington and British Columbia show that between June 1 and August 15, 1916, 3,768 automobiles, carrying 14,700 persons, crossed the boundary at this point. About 75 per cent. of the vehicles were American owned.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

"THE BUSINESS SIDE OF ROAD BUILDING"

Sound presentations of the economics of highway betterment appear with such comparative infrequency in the columns of the lay press that such as do find their way into the newspapers are worthy of something more than passing note. The subjoined quotation, printed under the caption above, is from the "Times," of Beaver, Pa., and sets forth facts not often appreciated by the layman in so interesting and instructive a manner that we are glad to reproduce it here:

"Buying good roads is a business transaction. Good bargainers get better road value for their money than poor bargainers. Poor bargainers usually do not know what good road value is. They see something they like in their travels and buy it for home use, without stopping to consider that this may be as ridiculous as to put on a dress suit to feed the cows. No man can make a good bargain for roads who does not know what is needed; yet a large part of the $300,000,000 which is being spent on American roads this year is paid out by men who do not know what is a good bargain in roads. This is not wholly their fault, for little has ever been said about the real economics of road construction.

"Nobody but a spendthrift thinks of spending more money than he has on something he needs. He fits his expenditures to his income, if he is sensible. A sensible road commission tries to do the same, but it is often hampered by a lack of knowledge of how to proceed. Detailed knowledge of this nature is only gained by wide observation, keen insight and shrewd judgment, and for this reason a competent state highway commission possessing such knowledge can render great aid to local authorities who apply to it for advice.

"The first thing to be considered in buying good roads is the amount of money which it is wise for a community to spend for them. Most estimates of this nature are based on the existing annual tax receipts available for the purpose. This is not the best basis for a sound judgment. A family of three persons can make an income of $1,800 go farther than a family of six persons can. It is the same with roads. To find out roughly how much money can be devoted to road work it is best to divide the assessed valuation of the district by the miles of roads in it. This gives the valuation, or taxable wealth, of the district per mile of road.

"We deplore the mortgage the clerk puts on his home to buy an automobile unnecessary for the welfare of his family. And yet we complain when a county with a very low valuation per road-mile is not intersected with roads as smooth as the top of a billiard table. This shows that we have our foolish ideas, like the extravagant clerk.

"There is a measure of the need for roads, just as there is a measure of the financial resources for road building. This measure is the travel the road is carrying now and the probable increase in the travel during the next five to ten years. The improvement of a country road results in the slow development of property along it, so that there is a slow annual increase in what is called the residential travel."

Major Crosby Given High Assignment With Army on Mexican Border

Major Walter W. Crosby, of Baltimore, Md., has been appointed Assistant to the Chief of Staff, 15th Division, United States Army, with headquarters at Laredo, Tex. This is about the highest assignment that could be given to an officer not of the regular army.

Major Crosby is Inspector General of the National Guard of Maryland and since the mobilization of state troops on the Mexican border has been serving as recruiting officer at Salisbury, Md. He is especially well known in the road building field and is Treasurer of the American Road Builders' Association.

Illinois Plans to Spend $2,130,000 for Road Construction Next Year

According to figures compiled by W. W. Marr, Chief Engineer of the Illinois State Highway Commission, the State of Illinois will spend approximately $2,130,000 for road construction during 1917.

This sum includes the state's apportionment of the federal government fund, a similar amount to be appropriated by the Legislature and the funds derived from the sale of motor vehicle licenses.

These amounts will be approximately as follows: Federal aid, $440,000; state appropriation necessary to secure federal aid, $440,000; receipts from the sale of motor vehicle licenses, $1,250,000.

Purpose Moving County Line to Facilitate Improvement of Street

With a view to conserving the interests of property owners and facilitating street improvement and maintenance, a bill is being prepared for presentation to the next session of the New York Legislature, providing for the shifting of the Nassau County line in order to place McNeil Avenue wholly under the jurisdiction of the county authorities.

At present this thoroughfare lies partly within Nassau County and partly within the Borough of Queens, New York City. It is one of the most traveled highways on Long Island and its location on the boundary line has interfered to some extent with its improvement.

Recently an agreement has been reached between the county authorities and President Connolly of the Borough of Queens and the street will be paved with asphalt block.

The bill which is being prepared contemplates the shifting of the county line slightly to the east, so as to place the entire avenue within Nassau County. It is understood that the city and county officials have agreed to the proposed change.

COMING MEETINGS

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October 18-19—League of Minnesota Municipalities.—Annual meeting, Red Wing, Minn. Secretary, Richard R. Price, University of Minnesota, Minneapolis, Minn.

October 26-28—League of Texas Municipalities.—Fourth annual convention, Hillsboro, Tex. Secretary-Treasurer, Prof. H. G. James, Austin, Tex.

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State-Wide Good Roads Meeting in Maine

What is expected to be the most widely attended good roads meeting ever held in Maine will take place at Augusta, Me., on October 4, preliminary arrangements for the gathering having been made at a meeting held last spring in Bangor, Me.

The arrangements are in charge of Prof. George T. Files of Bowdoin College, as Temporary Chairman, and W. B. Moore, Executive Secretary of the Portland Chamber of Commerce. The meeting will be under the auspices of the Portland Chamber of Commerce, the Maine State Board of Trade, the Maine Automobile Association, the Bangor Automobile Association and about 30 others of the leading organizations of the state.

It is planned to organize a campaign for the continuation of the present system of road building in Maine and to secure the passage of a mill tax measure at the coming session of the Legislature for the purpose of raising funds to carry on the work.

National Paving Brick Manufacturers' Association

The annual meeting and conference of the National Paving Brick Manufacturers' Association at Terre Haute, Ind., has been extended to cover two days, October 5 and 6. The meeting proper will be held on the 5th and the following day will be devoted to a construction demonstration at Paris, Ill.

Headquarters will be established at the Deming Hotel, Terre Haute, where the sessions of the annual meeting will take place and where a reception committee will attend to the comfort of the visitors.

There will be an inspection of the brick paved streets of Terre Haute on the morning of the 6th, after which the entire conference will go by trolley to Paris, Ill., and from there by automobile to the point of the construction demonstration. In the evening there will be a banquet at Terre Haute.

The Chamber of Commerce of Terre Haute will welcome the visitors to that city and members of the Illinois State Highway Commission will look after the arrangements at Paris. Those desiring hotel accommodations are asked to notify the secretary of the association, Will P. Blair, B. of L. E. Building, Cleveland, O.

MEETING

The annual meeting of the New York State Association of County Superintendents of Highways was held in the Onondaga County Court House at Syracuse, N. Y., on Wednesday and Thursday of this week, with President James F. Loughran, of Ulster County, in the chair. The program was published in the preceding issue of "Good Roads."

PERSONAL NOTES

August Johnson, for many years Street Commissioner of Fargo, N. D., died recently of injuries received by being crushed under a concrete mixer.

Adolph G. Carlson, formerly Assistant Superintendent of the Syracuse, Ind., plant of the Sandusky Portland Cement Co., has been appointed Chief Engineer of the Universal Portland Cement Co., Chicago, Ill.

J. T. Bullen, M. Am. Soc. C. E., who has been Engineer of Caddo Parish, La., has resigned to assume charge of road construction in Raleigh County, W. Va., where $850,000 is to be expended in several districts.

NEWS NOTES

Calcasieu Parish, La., which only recently completed roads and bridges under a $1,200,000 bond issue, is considering a further bond issue of $600,000 for the same purpose.

Stephenson County, Ill., will vote on a bond issue of $850,000 for road construction at the November election. It is proposed to build 150 miles of highways if the issue carries.

A Bond Issue of $800,000 has been voted in Brooke County, West Virginia. According to present plans the funds derived from the sale of the bonds will be used for the improvement of about 15 miles of road.

All of the 28 Counties of Utah contain portions of the national forests and consequently all share in the percentage of national forest receipts which is paid over to the road fund. This, according to the Forest Service, is true of no other state.

The Government of Venezuela, according to a consular report, has determined to build a highway from Caracas to San Cristobal, a distance of approximately 683 miles. It is believed that the work will be done by the Ministry of Public Works.

The Sum of $1,501,089.23 has been turned over by the Secretary of State of Michigan for highway work. The money was received from the new automobile tax and from the sale of licenses to cars outside of the state. Of the total, $1,466,974.38 will be shared equally by the counties and the State Highway Department, while the balance will go to the department.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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NEW YORK, SEPTEMBER 23, 1916

Number 13.

County Road Construction and Maintenance*

By J. C. DAYTON†

On January 1, 1916, including one road under construction, we had 101 miles of state road and state built county highways in Cayuga County. We were glad to get the state built roads; we would like to have more, but even if the whole state legislative map of 1907 is completed in Cayuga, we would only have one mile in ten of the 1,497 miles of the road in the county state built and our people want more than that. In an effort to give them what they wanted Section 320A was evolved and put on the statute books. Section 320 limited roads built to letting by contract and 320A and 320 are in opposition chiefly in the one point of contract work versus cost account work.

Contract work of necessity requires engineering and surveying, measuring of quantities as a basis for pay, blue prints, advertising, inspection and careful watching to see that the contractor lives up to the contract, and an allowance for contractor's profit and moving contractor's plant. Force account work under charge of the town superintendent of highways eliminates most of the measuring of quantities and of inspection, although some inspection and comparison of cost reports is necessary. Hence, although I know of instances where force account work has failed and of one instance where political debts were paid by placing political sinecures on the job, I believe that force account work gets all of the money, practically, into the road. It is the man in charge who counts.

Under 320A, the man directly in charge of the work is the town highway superintendent. He is a man chosen and elected by his neighbors who know him well, to spend their money. He sometimes comes without road building experience, but he is a chosen man and nine times out of ten he will learn and learn quickly. There is a provision in 320A for a change if necessary.

We have been having town superintendents' meetings monthly during the winter months and the best results of these meetings are not in any formal talk or lecture, but in getting them arguing among themselves about road methods.

I have made the statement that I could pick eight or ten men from my 23 town superintendents that in organization methods, in handling men and getting results would compare favorably with contractors' foremen on road work.

Now, let's get back to the county system of roads and, since you have asked me to talk about it, I suppose you want to know what we have done in Cayuga County.

First the plan and then the type of road. The map adopted by the Board of Supervisors to constitute the county system, was of 128 miles and was planned for five years ahead. The roads adopted were planned to supplement not to rival or compete with the state roads. As an instance, south from Auburn, between Cayuga and Owasco Lake, two state roads are planned and partly built. The three railroads are on each side and between the state roads. The county map added an extension of one other stone road at the extreme east edge and three cross roads connecting the state roads and passing the railroad depots, one 10 miles, one 14 miles and one 20 miles. They afford a good road in all conditions from the main roads to the railroad station, the creamery and a cross connection.

We are paying for our county system macadam as we go. We figured that the taxpayers of Cayuga County wanted roads and would be willing to invest $1.50 per thousand of assessed valuation in addition to other road taxes. When that is gone each year, we stop.

Now as to type of road. The plan is uniform in all towns; a 12-ft. metal water bound macadam. We plan to build as inexpensively as possible and that involves using local stone wherever possible. We have used sandstone, limestone and mixed glacial drift stone. Cayuga County, 75 miles long from north to south, has eleven geological formations from the sandstone of the Siluric age to the Hatch flags of the Devonic. Where we use sandstone or field stone of glacial drift origin, we learned, after the first year, to buy and supplement, partly supersede, the local stone dust with commercial limestone dust. It not only adds to the appearance of the road, but it adds greatly to its value through better binding together.

We have no unbending rule for grading except that stone shall not be laid on grades over 10 per cent. Quite frequently we grade much lower raises where conditions especially favor it, as taking off the top of a knoll or raising up from both sides. As a rule, the travelled road with more or less gravel spread for years, or even the crust hardened by travel, affords a foundation that is too valuable to sacrifice for minor grading. We use the old road bed as much as possible and I have frequently put a "U" in a road when I could have used a straight line, rather than get off the old road bed. Almost always the road needs widening and this is done one side or the other as the best results in straightness can be obtained.

We shape road and throw up shoulders largely with a roller and grader. According to conditions we pull earth from the ditch line for the shoulder or we shape the road and push the dirt out for shoulders. Generally on high spots, we bury the road by pushing the dirt out. On low spots we generally bring in from the sides. Where the old road bed already has a good crown, we bring in from the ditches for shoulders. We try to start with a crown on the subbase; it is hard enough to keep.

We lay 5 ins. of stone from 3-in. up and including tailings. We use, or pretend to use blocks to measure. We frequently average it, taking out equalities with this stone. The town superintendent wants a road to do him credit and contrary to the rule with contracts, the quantity of stone nearly always overruns. We roll this stone until pretty well compacted, beginning with the hind wheel of the roller about 4 ins. onto the shoulder dirt for the first roll, then fill it with worn road earth from the roadside or fine gravel or sand hauled in. Then we roll again until, when the load of top stone runs over it, it leaves only a surface mark. We have to rebuild a shoulder say 3 ins. or 4 ins. for the top course. The top of 3 ins., filled with stone dust, is water puddled.

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*Extracts from a paper presented at the convention of the New York State Association of County Superintendents of Highways, Syracuse, N. Y., September 13-14, 1916.

†County Superintendent of Highways, Cayuga County, N. Y.

We seldom bother with puddling until the stone is laid, unless we get a rain. Get the top rolled and filled and ready for water and then a good rain frequently saves hundreds of dollars. The roller man is a full-time man, busiest when it rains. The broom rigging behind the roller works well, but a good man or two with a rattan broom on the spots where he is needed, is better. We frequently haul water to supplement the rain and help the puddle when the rain stops crushing and laying stone.

Our sizes in the screens on the crushing outfit are undergoing a change. I once thought that for general town use, especially where placed on the road without a roller as was once the custom, 1-in., 2-in., and 3-in., and tailings made a complete bin. Now we use ½-in., 1¼-in., 2¼-in., 3½-ins. and tailings and we mix our tailings right in with the No. 4 for bottom course. The sizes from ½-in. to 1¼-in. we take out and store. That size stone has no place in water bound road. If you put it in the top it is hard to puddle and will ravel quickly, but it is just what is wanted for maintenance work and that brings me to another point.

The building of a road is but one step of the work. Even during its construction, we plan for its preservation and maintenance. No road at whatever cost is a permanent road, least of all a water bound macadam, without attention.

We have felt that we did not want to oil any road until it had had time to find itself; to develop whatever weaknesses there were. Generally weak spots, holes, are faults in the subbase. Let these have time to show up. We did no oiling in 1914 or 1915, but this year our committee bought 300 gallons of K. P. oil mixed with stone and sand and filled depressions with it. Criticising it to find its faults, I believe we used too strong a mixture of the oil, the patches were often too soft and after using all that was needed we have 100 gallons left. We compressed the patches with the roller and then spread a coat of Tarvia B over the road.

If I can get my board to buy a distributor next year I am going to have it loaf along on the job, to wait for the stone spreaders to get up close. If I have my way I won't have any oil spread over ten minutes ahead of the stone. We tried to spread one section with stone first and then poured the tar, but the same quantity that got results on other roads was not enough to afford a union of the loose stone with the macadam below and we had to give the road an additional coat. That made a good job of it.

Venezuelan Government to Build 800-Mile Road Across Seven States

Provision has been made in an executive resolution for the construction of what is known as the "Great Western Highway of Venezuela," to connect the cities of Caracas and San Cristobal, the latter being the capital of the State of Tachira in the extreme southwestern part of Venezuela.

The airline distance between the two cities is 425 miles, but, according to a report from Preston McGoodwin, American Minister of Venezuela, the tentative plans call for a highway approximately 800 miles in length.

The proposed highway follows a route traversing the seven states of Miranda, Aragua, Carabobo, Cojedes, Portuguesa, Zamore and Tachira. It is understood, as noted briefly in "Good Roads" for September 16, that the highway will be constructed by the Ministry of Public Works.

Plan Road Between Annapolis, Maryland, and the National Capital

Plans for the proposed road from Annapolis, Md., to Washington, D. C., appear to be progressing favorably. The project is said to have the support of Governor Harrington of Maryland and Chairman Frank H. Zouck and other members of the Maryland State Roads Commission.

At its last session, the Maryland Legislature passed a bill appropriating $125,000 for the road, with the condition that a similar amount be appropriated by the federal government. Bills providing for this appropriation were introduced in Congress by Senator Smith and Representative Mudd of Maryland, but failed of passage. There is therefore some question as to whether the money appropriated by the state can be used in the absence of a specific appropriation by the government.

L. E. Greenbaum, counsel for the State Roads Commission, is of the opinion, in which State Attorney General Richie is said to concur, that some of the present state funds can be utilized for building the road as well as the money that will be due Maryland this year from the federal aid road fund. Those who are advocating the construction of the road are urging that the state take $44,000 of the legislative appropriation to combine with the similar sum that the state will receive from the government.

Chairman Zouck of the State Roads Commission is quoted as saying that such a course will not be necessary; that there is no question but that the government would approve the expenditure of the $44,000 government money on the proposed road and that there is now available $109,000 of the allotment of state road funds to Prince George County, Md., for the construction of that part of the highway that lies within that county.

Acting on this idea, Chairman Zouck has ordered surveys made of the route and it is the present plan to begin the work of construction next spring. The road would, therefore, be well under way by the time the next Legislature meets, and it is believed that that body will then remove the restrictions on the $125,000 appropriation and permit this money to be used for the completion of the road.

The line to be followed will be in the main, that of the Old Post Road, although some relocations will be necessary in order to straighten the road and to eliminate excessive grades. The Old Post Road is one of the oldest and most historic of Maryland's highways but is, at present, almost impassable in parts.

Street Improvements in Duluth, Minnesota, Depend Upon Charter Amendment

At least thirty important paving contracts and the construction of a bridge across Chester Creek in Duluth, Minn., are contingent upon an amendment to the city charter, which is to be voted on at a special election to be held next Tuesday.

The proposed amendment provides for a tax levy of three mills, to be used for the creation of a special fund for street improvement. Should the amendment fail of passage, Commissioner of Works Farrell says that the work planned for next year will be held up indefinitely.

Plans for the proposed bridge noted above call for a concrete structure, the estimated cost of which is $40,000. The paving contracts would involve the expenditure of approximately $700,000, of which the city's share would be about $180,000, according to estimates. It is the latter amount that would be raised by the proposed three-mill levy.

The Commissioners of Bannock County, Idaho, presented the first application in that state for a road to be constructed under the government appropriation for forest roads. The application asks for a road across the Caribou national forest.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Sutter County, California, Planning to Build Three Bridges

The construction of three bridges and the completion of a bridge already partly built, is being considered by the Board of Supervisors of Sutter County, Cal. Two of the proposed new bridges are intercounty structures.

According to estimates, the total cost to Sutter County would be about $300,000, and it is planned to raise this amount by a bond issue to be submitted to a vote at the November election.

The intercounty bridges are over the Sacramento River, between Sutter and Colusa Counties at Grimes, and over the Feather River, between Sutter and Yuba Counties, near Live Oak. The third bridge is over the Feather River at Nicolaus.

Sutter County's share of the cost of the Grimes and Live Oak Bridges would be $45,000 and $30,000, respectively. The estimated cost of the Nicolaus Bridge is $165,000. The sum of $60,000 would be needed to complete the Long Bridge trestle.

Contract for Warrior Highway in Alabama Delayed by Injunction

The Board of Revenue of Jefferson County, Ala., has been enjoined from awarding the contract for the construction of the Warrior Highway from the Warrior River to Nichol's Fish Trap, where it joins a road leading into the city of Birmingham.

A temporary injunction was granted by the Circuit Court on application of E. B. Hyche of Bessemer, Ala., who alleged ulterior motives in the selection of the Nichol's Fish Trap route. It was also alleged that the issuance of $275,000 in warrants to pay for the road, would jeopardize the credit of Jefferson County.

Bessemer, Ala., where Mr. Hyche and others interested in securing the injunction, live, is off the line of the Nichol's Fish Trap Road and is interested in the development of what is known locally as the Taylors Ferry Highway, another route from the Warrior River on which work is being done by convicts.

It is stated that the Nichol's Fish Trap Road has already been designated as a state aid highway and that, should the injunction be made permanent, the construction will proceed with state funds.

Large Mileage of Roads in Ohio Built With State Aid

The Ohio State Highway Department will receive bids September 28 for the construction of approximately 44 miles of roads in 17 counties, which will cost $433,424.23 according to the department's estimates.

With the letting of these contracts, the state will have let a total of approximately $7,500,000 worth of road work during the year, covering the construction of about 574 miles of state aid roads.

San Bernardino County, California, Considering Million Dollar Bond Issue

The Board of Supervisors of San Bernardino County, Cal., is considering a plan for a complete system of roads in the San Bernardino mountain range, which involves a bond issue of at least $1,000,000.

The plan contemplates the construction of approximately 130 miles of 9-ft. roads through the mountains and the collection of a $2 toll from motorists who use the roads, for the purpose of providing funds for the payment of interest and the creation of a sinking fund.

Industrial Highway Under Consideration at Alameda, California

The City Council of Alameda, Cal., is considering a project to construct an industrial highway to run practically the entire length of Alameda Island on the Oakland side.

This is regarded locally as a most important municipal undertaking, as it would provide a thoroughfare for vehicular and rail transportation to and from the factory and shipping enterprises on the north waterfront of the city.

Efforts to acquire the necessary right of way are said to have met with gratifying success, as, in most instances, assurances have been given that the rights could be secured without cost.

Residents of Linn County, Oregon, Ask for Increased Road Tax

The County Court of Linn County, Ore., has been petitioned to submit to a vote at the November election a proposition to levy an additional two-mill tax for road improvement throughout the county.

It is proposed that the road and bridge fund levy of 1.3 mill, and the road district fund levy of 2.5 mills, be reduced to 0.3 and 1 mill respectively and that the 2.5 mills thereby released, together with an additional levy of 2 mills, be set aside for the purpose of working out a plan of road improvement.

The plan is endorsed by the Linn County Grange and the Linn County Farmers' Union. A joint committee of both organizations has prepared a list of seven roads to be improved from 1917 to 1920, after which a belt road is to be constructed.

COMING MEETINGS

September 26-28—League of Virginia Municipalities—Annual meeting, Clifton Forge, Va. Secretary, Luther C. Brinson, Portsmouth, Va.

October 5-6—National Paving Brick Manufacturers' Association.—Conference, Terre Haute, Ind. Secretary, Will P. Blair, B. of L. E. Building, Cleveland, O.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 10-15—League of California Municipalities.—Annual meeting, Visalia, Cal. Secretary, H. A. Mason, Pacific Building, San Francisco, Cal.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

October 13-14—Society for Street Cleaning and Refuse Disposal.—Annual meeting, New York, N. Y. Secretary, Joseph R. Buchanan, Municipal Building, New York, N. Y.

October 18-19—League of Minnesota Municipalities.—Annual meeting, Red Wing, Minn. Secretary, Richard R. Price, University of Minnesota, Minneapolis, Minn.

October 26-28—League of Texas Municipalities.—Fourth annual convention, Hillsboro, Tex. Secretary-Treasurer, Prof. H. G. James, Austin, Tex.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

American Society of Municipal Improvements

The 23rd annual meeting of the American Society of Municipal Improvements will be held at the Robert Treat Hotel, Newark, N. J., October 9, 10, 11, 12 and 13, the first day being devoted to the meeting of the Committee on Standard Specifications.

Included in the preliminary program are a number of matters of special value to those interested in street paving, among them being papers by George C. Warren, President, Warren Brothers Co., Boston, Mass.; Henry W. Durham, consulting engineer, Hackensack, N. J.; and Will P. Blair, Secretary, National Paving Brick Manufacturers' Association, Cleveland, O. These papers will deal particularly with problems connected with street construction, maintenance and administration.

A paper on the use of vertical fiber brick and wood block will be presented by E. A. Kingsley, San Antonio, Tex., and one on oil treatment of wood blocks by P. C. Reilly, Indianapolis, Ind.

The report of the Committee on Standard Specifications, of which George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York City, is chairman, will contain specifications for wood block pavement and a number of proposed changes for existing specifications.

The Committee on Street Paving will present a report on the practice regarding the treatment of cuts in pavements.

The annual meeting of the American Association of State Highway Officials will be held at St. Louis, Mo., on December 5, 6 and 7. The program is in course of preparation. Henry G. Shirley, Chief Engineer of the Maryland State Roads Commission, Baltimore, Md., is President of the organization and Dr. Joseph Hyde Pratt, State Geologist of North Carolina, Chapel Hill, N. C., is Secretary.

PERSONAL NOTES

R. R. Feller has been elected County Engineer of Wood County, W. Va., to succeed Burdette Woodyard, whose resignation is noted elsewhere in this column.

Edward St. C. Smith, formerly State Highway Engineer of Idaho, has assumed charge of road construction in the Piedmont District of Mineral County, W. Va.

D. K. Caldwell has been appointed Engineer of Caddo Parish, La., to succeed J. T. Bullen, M. Am. Soc. C. E., whose resignation was noted in the preceding issue of "Good Roads."

Lieut. H. S. Baker, Illinois National Guard, who, in civil life is First Assistant City Engineer of Chicago, Ill., is directing the survey of the road between San Antonio and Austin, Tex.

Prof. R. L. Morris has resumed his duties at the University of West Virginia after acting as consulting engineer in connection with road improvements in the White Sulphur District of Greenbrier County, W. Va.

L. P. Scott has been assigned to Division 1 of the Illinois State Highway Department as Maintenance Engineer with headquarters at Aurora, Ill. He was formerly a draftsman in the department's Bureau of Roads.

Burdette Woodyard has resigned as County Engineer of Wood County, W. Va., to become Engineer in charge of road construction in the Walton and Spencer Districts of Roane County, W. Va., where $448,000 is to be expended on improved roads.

T. F. Malloy has been appointed Engineer in charge of road construction in the Falls and Sewell Mountain Districts of Fayette County, W. Va., where work involving the expenditure of $350,000 is under way. Mr. Malloy's headquarters will be at Landisburg, W. Va.

NEWS OF THE TRADE

The Walter A. Zelnicker Supply Co., St. Louis, Mo., has just issued its September Bulletin, a 40-page book descriptive of the company's offerings of road machinery and contractor's equipment generally.

The Russellville Road Building Co., Russellville, Mo., has been incorporated under the laws of Missouri, with a capital stock of $3,900. C. S. Glover, J. J. Glover and A. J. Sauerhage, all of Russellville, are interested.

The Commissioners of Crockett County, Tex., have organized road gangs in various parts of the country to repair roads which were damaged by recent heavy rain.

The California State Highway Commission, in cooperation with the Sacramento, Cal., Good Roads Association, gave a demonstration of concrete road building at the recent state fair at Sacramento, showing the methods employed in the construction of state highways.

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Number 14

The Contractor's Viewpoint*

By GEORGE MILTON SAVAGE †

In assigning me the subject the "Contractor's Viewpoint," I take for granted it was intended to cover his viewpoint on road construction and general contracting as well as the relationship that should exist between the engineer and the contractor, which latter point has always been a hobby of mine.

First, as to road building and contracting in general, I shall leave largely to men better qualified to express themselves, but in passing will say that we contractors believe the best road that can be built within the money available, is the cheapest in the end; that no type of pavement is best suited for all roads under all conditions. We do not believe that the present method of construction is always the best, but we do believe that the county and state is entitled to a dollar's worth of value for every dollar spent. That it is working no hardship on the contractor to require him to live up to the terms of his contract in a sane and practical way.

Illustrating what I mean by sane and practical, every engineer and contractor knows that specifications for road work are general specifications, and are seldom drawn for the particular road under construction, and if the specifications should call for sand and gravel mixed in certain proportions, the gravel for instance to pass a two-inch ring and to be retained on a ½-in. ring containing not over 5 per cent of material passing a ¼-in. ring, the sand to be graded from ¼-in. down, and it should be found by actual test that the material was all right, except that 15 per cent. of the gravel instead of 5 per cent., passes the ¼-in ring, in other words, comes under the classification of sand, the sane and practical way would be not to condemn the material, as is sometimes done, but to raise the percentage of gravel, and lower the percentage of sand used, until you have the mixture called for in the specifications. This would in no way change the quality of the work, but would be adapting the specifications to the conditions surrounding that particular contract without loss or injury to the state or county.

Take another case, where the profile is made up from field notes in the office by a man who has never been over the road to be improved and shows a slight cut for a long distance, just enough to break through the hard crust that has been formed by years of travel, and the compacting of numerous layers of gravel that has been put on in the past by the road supervisor or others. In other places shallow cuts have been made in an effort to cut down expense; in this case we believe the sane and practical way is not to break up the good foundation that could make no possible difference to travel, and would only be lowering the lasting quality of the road, but to use the saving made here to lower the cuts where the grade would be improved by so doing. In other words the engineer in charge should be one who has had experience in like work and should be given the authority to adapt the specifications to the work in hand in a practical way, having in mind the best road of its kind to be had under a commonsense interpretation of the specifications.

There are many more instances where the specifications are at fault and call for the wasteful expenditure of money and where a little cooperation between the engineer and contractor would mean a great saving to the public.

And this brings me to the relationship that should exist between contractors and engineers. And right here I wish to say that I have the greatest respect for the engineers of the State of Washington. In my 25 years of contracting in this state, I have met but few who were not striving to give the public the best there was in them, or who were not willing to treat you fairly once they were convinced of a like disposition on your part. In some instances, however, a young engineer starts out with the belief that all contractors are dishonest and unfair in their methods, that they will try to get the best of him wherever possible, that it is up to him to go them one better by trimming them first. This is all wrong, for the contractors as a whole are as honest as any other set of men. They have a sincere desire to do their work well, and to cooperate with the engineer to that end. It is true they believe they are entiled to a fair profit, and where the specifications are not clear and definite, that the contractor should be given the benefit of the doubt. They do not believe that the county or state should benefit at the expense of the individual.

It sometimes happens on important contracts that an engineer or inspector is appointed through political influence, one who is totally unqualified in everv way to fill the position. He may be arbitrary and unreasonable, but the more a contractor complains, the better standing the inspector has with the public, as they believe the inspector or engineer is only trying to make the contractor live up to his contract. It matters not what the previous record of the contractor has been, he gets very little sympathy when he complains of unfair treatment. It is no wonder then that contractors in self-defense will, at times, resort to questionable methods in an attempt to secure an even break.

I have heard engineers boast of the contractors they have broken, taking pride in their reputation for not allowing contractors to make money on their work. I have also heard contractors boasting of how they had beat this or that engineer and made profit by slighting their work. One case is just as bad as the other, and as long as you have engineers who are trying to beat the contractor you will have contractors who are trying to beat the engineer. The only remedy is for the engineer and the contractor to get together, become better acquainted, learn each other's views and ideas, discuss their differences, and formulate plans for a better understanding.

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*Extracts from a paper presented at the Convention of the Washington State Association of County Engineers, Tacoma, Wash., September 14-17, 1916.

†President, Washington Paving Co., Seattle, Wash.

The engineer and the contractor are educated along different lines. The engineer is educated along more technical lines, while the contractor's education is along the lines of economy, and how to get the best results through the least expenditure of energy or money. I believe that great good would result to the State of Washington, and the business in general, if a feeling of confidence and respect could be inspired between contractors and engineers, so they could meet and discuss frankly the different matters of mutual interest, giving their best thought and judgment to the subject under discussion and being influenced by no selfish or ulterior motives. I believe in these meetings of yours if you would invite some of the reputable contractors of the state, to meet with you and discuss various questions of interest much good would result therefrom.

From a contractor's viewpoint, the present method of awarding contracts is far from being the best, as the only thing now required to secure a contract is a low bid, and the ability to furnish bonds. It makes no difference whether the contractor has had previous experience in this class of work or not, nor how dilatory he has been in the past or how difficult it has been to make him live up to the terms of his contract. These things are not considered; there is only one question asked: Is he low bidder? Another contractor may have spent years in this particular line of contracting, always living up to the terms of his contracts, taking pride in his work, willingly giving a dollar's worth of service for every dollar received, and trying in every way to elevate his calling and improve conditions for the public good. May be morally and financially strong, able to go through satisfactorily with anything he undertakes, but if he is not the low bidder he does not get the work, although the low bidder may be a poor moral risk, unable to finance his work properly, known to be dishonest and undesirable in every way except the price. Still he gets the contract. This method of awarding puts a premium on fraud and dishonesty and is a handicap to the honest contractor, as many contracts have been taken in the past with the only profit possible such as could be made by beating the specifications, and when this could not be done the bonding company has had to complete the contract. This method of awarding contracts will not elevate the calling, nor will it improve the quality of the work, or lighten the burdens of the engineer, but on the other hand, if it were known that any contractor caught deliberately trying to beat his work or refusing to pay his bills would be blacklisted all over the state; that no contracts for state or county work would be awarded to him, also that the previous experience and reputation of contractors would be taken into consideration in making an award, you would see a great change in the disposition of some contractors. They would begin to take a pride in their work, striving to see who could do it in the most satisfactory manner, in a way that would give them the most lasting advertising.

Incidentally, one-half of your troubles would be over, as the contractor would be striving to find and point out weak spots in the plans or specifications to protect his own reputation. Sufficient publicity will cure most evils.

I hope to see the day when all road construction is removed from politics and is under the direct control of a man of proven ability, wide experience and unquestioned reputation; the day when contractors and engineers can meet, discuss frankly their differences, and when each will be accorded a respectful hearing in an earnest endeavor to improve conditions by combining the practical experience of the contractor with the higher education of the engineer.

Inability to Levy Assessments Will Block Cleveland, Ohio, Paving

According to a statement attributed to Commissioner of Licenses and Assessments Cukr of Cleveland, O., the inability of the city to serve all notices of assessment upon abutting property owners who pay a portion of the cost of the proposed 1917 paving in Cleveland will, block the paving plan.

The contemplated work involved the paving of the main thoroughfares and county roads within the city limits and was contingent upon the approval by the voters of a $3,000,000 bond issue and the obtaining of an emergency tax levy by the commissioners of Cuyahoga County. Details of the proposed work were published in "Good Roads" for June 10.

Des Moines, Iowa, Committee Plans Paving and Traffic Regulation

The Greater Des Moines Committee, an influential commercial and civic organization of Des Moines, Iowa, has inaugurated a campaign for street construction, paving and the regulation of traffic in the downtown district.

A comprehensive plan of arterial streets leading to the business district is a part of the movement. The scheme includes three north and south streets, none of which is now in existence, the extension of one east and west street to the city limits and the construction of four diagonal streets, each to have a width of 80 ft.

Among other things, the proposed traffic rules would prohibit pedestrians from crossing streets except at intersections and then only with the traffic. No vehicle would be permitted to pass another while crossing an intersection and all vehicles desiring to turn in the opposite direction would be compelled to go around the block.

Committee Appointed to Formulate Bill for Texas Highway Department

John W. Warren of San Antonio, Texas, Chairman of the Legislative Committee of the Texas Good Roads Association, has advised George D. Martin of the United States Office of Public Roads, who is acting temporarily as State Highway Engineer of Texas, of the appointment of the committee to draft a bill for the creation of a state highway department in Texas.

The committee is composed of George D. Marshall, Austin; Homer D. Wade, Stamford; H. B. Terrell, State Comptroller, Austin; Judge George N. Denton, Waco; Leonard Tillotson, Sealy; Judge Adrian Pool, El Paso; Walter D. Caldwell, Austin; Judge T. L. Beauchamp, Paris; Carlos Bee, San Antonio; C. O. Laney, Dallas; William T. Bagby, Halletsville; F. M. Gibson, Bonham; Judge Jesse M. Brown, Fort Worth; Robert J. Eckhardt, Taylor; D. E. Colp, San Antonio, Secretary, Texas Good Roads Association.

The committee will meet at Austin, Texas, within a short time, and will prepare a measure to be submitted to the next session of the Legislature. It is understood that the Savage-Tillotson bill, which was before the last Legislature, will be used as a basis for the new measure.

Hickman County, Tenn., has voted to issue bonds to the amount of $250,000 for road construction.

Reconstruction of the Neuces County, Tex., Causeway will begin at once. The causeway, which extends from Neuces County to San Patricio County, was damaged by the hurricane of August 18. The work will require between five and six months to complete.

Blackhawk County, Ia., is building five model gravel roads, each one mile in length, at a cost of a little more than $5,000 a mile. The roads are in widely separated portions of the country and are intended as an object lesson to taxpayers of the value of good roads. The ultimate object is the authorization of a bond issue next year to permit the graveling of the entire county road system of 170 miles.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Proposed Roads in Boulder County, Colorado, Would Cost $500,000

Completion of the county system of primary and secondary roads recommended by County Surveyor F. A. Fair, would cost Boulder County, Colo., approximately $500,000 and the County Commissioners are considering the matter of submitting a bond issue of that amount to the voters.

According to the plan of the county surveyor, there would be a total of 160 miles of primary roads, of which 93 miles would be so-called valley roads and 67 miles would be mountain roads. These, it is estimated, would cost about $300,000. In addition, there would be about 83 miles of secondary roads which would cost approximately $200,000.

The bond issue has the support of the Boulder Commercial Association, and the Colorado Good Roads Association is also interested.

Half-Million Road Expenditures Recommended in Hennepin County, Minnesota

In a report to the Board of County Commissioners of Hennepin County, Minn., County Surveyor E. E. Terrell recommends the expenditure of about $500,000 for road construction and improvement during 1917.

This sum would be used on some of the county's arterial highways and would include also the construction of bridges and culverts. Mr. Terrell advocates the use of either concrete or macadam with bituminous surfacing.

The longest stretch of road to be improved would be 10 miles of the Eden Prairie Road and this, according to estimates, would cost $40,000 for grading and $170,000 for concrete pavement or $125,000 for trap rock base and sand filler construction.

The Rockford Road would cost $25,000 for grading and concrete culverts and either $135,400 or $108,400 for paving with either of the two materials noted, for a distance of 8.55 miles. Smaller roads and bridges make up the balance of the amount which it is believed would be necessary to put the county's roads in good order.

Extensive Road Work Program Outlined for Dallas County, Texas

In an exhaustive report to the County Commissioners' Court of Dallas County, Texas, County Engineer J. F. Witt has made recommendations for an extensive program of road work, which will involve a total expenditure of approximately $1,600,000.

The program calls for the improvement of the 12 principal roads of the county at an estimated cost of $493,000, the building of one hundred miles of water-bound macadam roads with asphaltic top, ten miles of concrete pavement and eighty-five miles of gravel roads, at a cost of $1,069,500, and the expenditure of $37,500 for correcting the alignment of existing roads.

Proposed improvements to the twelve principal highways range all the way from minor repairs to bridges, to paving with concrete, the details and estimated costs being as follows:

Dallas-Fort Worth Road, making all bridges permanent, paving two sections with concrete, a total distance of 2.95 miles. Total cost, $75,400.

Dallas-Coppell Road, replacing timber bridges with permanent structures, 2 miles of concrete pavement, 18 ft. wide, 1.8 mile embankment with gravel surfacing and 1,000 ft. concrete bridging. Total cost, $106,700.

Dallas-Denton Road, replacing all timber bridges with either steel or concrete. Total cost, $16,500.

Preston Road, minor repairs to bridges. Total cost, $2,000.

Richardson Road, replacing timber culverts with concrete. Total cost, $4,900.

Garland Road, replacing timber bridges with either steel or concrete, one section of 18-ft. and one section of 16-ft. concrete pavement, raised earth embankment with gravel surfacing. Total cost, $58,300.

East Pike, replacing timber bridges and culverts with either steel or concrete structures. Total cost, $27,700.

Dallas-Seagoville Road, replacing all timber bridges and culverts with either steel or concrete, building a section of earth embankment with gravel surfacing and 700 ft. of steel and concrete bridging. Total cost, $84,900.

Miller's Ferry Road, replacing all timber bridges with either steel or concrete, earth embankment with gravel surfacing and 700 ft. of concrete bridging. Total cost, $44,500.

Lancaster Road, replacing timber bridges and culverts with steel or concrete structures and changing alignment of road. Total cost, $16,500.

Beckley Road, replacing all timber bridges and culverts with steel or concrete. Total cost, $31,200.

Cedar Hill Road, replacing all timber bridges and culverts with steel or concrete. Total cost, $25,400.

The cost of the proposed road construction noted in the second paragraph is figured on the basis of $14,000 a mile for concrete pavement, $7,000 for water bound macadam with asphaltic surfacing, and $2,700 for gravel roads, including engineering expenses.

The Taxpayers' Association of Galveston County, Tex., has gone on record as favoring the raising of the grade of the entire city of Galveston.

Street Laborers in DuBois, Pa., have asked for an eight-hour day and an increase of 25 cts. The present rate is $2 for a day of nine hours.

COMING MEETINGS

October 5-6—National Paving Brick Manufacturers' Association.—Conference, Terre Haute, Ind. Secretary, Will P. Blair, B. of L. E. Building, Cleveland, O.

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 10-15—League of California Municipalities.—Annual meeting, Visalia, Cal. Secretary, H. A. Mason, Pacific Building, San Francisco, Cal.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

October 13-14—Society for Street Cleaning and Refuse Disposal.—Annual meeting, New York, N. Y. Secretary, Joseph R. Buchanan, Municipal Building, New York, N. Y.

October 18-19—League of Minnesota Municipalities.—Annual meeting, Red Wing, Minn. Secretary, Richard R. Price, University of Minnesota, Minneapolis, Minn.

October 26-28—League of Texas Municipalities.—Fourth annual convention, Hillsboro, Tex. Secretary-Treasurer, Prof. H. G. James, Austin, Tex.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo., Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary Robert F. Hall, 210 South La Salle Street, Chicago, Ill.

The tenth Cement Show will be held in the Coliseum at Chicago, Ill., beginning on Wednesday, February 7, 1917, and lasting until Thursday, February 15. The exhibits will be grouped in the Coliseum proper, the balcony and the annex. It is believed that there will be a joint exhibit of cement companies, similar to the one at the last show.

MEETINGS

Southern Appalachian Good Roads Association

At the recent eighth annual convention of the Southern Appalachian Good Roads Association at Lexington, Ky., resolutions were adopted covering a wide range of matters in which the association is interested. Among other things the organization went on record as favoring the adoption of uniform legislation throughout the states in the southern region, providing for a state system of roads to be constructed by federal, state and local cooperation and to be maintained under state supervision, and for a system of intercounty roads to be constructed and maintained through state and county cooperation.

The association favored the patrol system of maintenance in another resolution and the application of all automobile license funds to the maintenance of state and intercounty roads.

Other matters covered by the resolutions were the endorsement of the employment of federal, state, county and municipal prisoners in the preparation of road materials and the construction and maintenance of roads and streets and the enactment of a uniform statute covering the issuance of bonds for road improvement.

The association decided to hold the next convention at Nashville, Tenn., and to enlarge its work by including in its membership the states of Florida, Mississippi, Louisiana, Texas, Arkansas and Missouri.

Henry Roberts, of Bristol, Tenn., was elected President of the association, and A. Gray Gilmer, also of Bristol, was chosen as Secretary-Treasurer.

County Commissioners and Engineers of Washington

At the recent meeting of the Washington State Association of County Commissioners and the Washington State Association of County Engineers, at Tacoma, Wash., it was decided to hold the 1917 meeting of the two associations at Spokane, Wash.

The following officers were elected by the County Engineers: President, J. D. Neville, Chehalis; First Vice-President, O. E. Brashear, North Yakima; Second Vice-President, Radford W. Rigsby, Pomeroy; Secretary-Treasurer, H. A. Sewell, Newport.

The County Commissioners elected the following officers: President, W. H. McVay, Spokane; Vice-President, T. Ives Dodge, Olympia; Secretary-Treasurer, H. A. Sewell, Goldendale.

PERSONAL NOTES

P. C. Powers has been appointed Street Commissioner of Memphis, Tenn.

W. J. Foster has been appointed Superintendent of Streets of Jacksonville, Fla.

G. C. Peterson, Highway Commissioner of Sheboygan County, Wis., has resigned to take a position in Santo Domingo, W. I.

Edward H. Deets has been appointed Superintendent and Resident Engineer in charge of road construction in Montgomery County, Md.

Raymond Ten Broeck, Highway Commissioner of Saugerties Township, N. Y., was killed recently when, according to report, his automobile crashed against a guard rail and was overturned.

W. B. Cauthorn, Columbia, Mo., has been designated by the County Court of Clay County, Mo., as Supervising Engineer of the road construction and improvement in Clay County, where $1,250,000 is to be expended.

NEWS OF THE TRADE

The John Kline Brick Co., Wickliffe, O., has been added to the Dunn Wire-Cut Lug Brick Co.'s list of licensees. The Kline plant has a daily capacity of 40,000 brick. J. C. Kline is President of the company.

The Holt Manufacturing Co., Stockton, Cal., has recently issued a folder descriptive of the "Caterpillar 45" tractor. The folder is printed in two colors and is illustrated with numerous half-tones of the tractor at work.

The Sam Fordyce Gravel Corporation, Edinburg, Texas, has been incorporated under the laws of Texas with a paid up capital of $15,000. The incorporators are Henry Klossner, A. J. Ross and Calvin V. Lysinger of Edinburg.

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The Highway Situation in Texas

By R. L. MORRISON *

Texas is at present spending nearly $20,000,000 a year on public highways, exclusive of city pavements. During 1915, road bonds to the amount of $7,155,554 were issued. In addition to this many of the counties financed road construction by means of long-term anticipation warrants, which are issued by the commissioners' courts. As these warrants do not pass through any central office it is very difficult to find out even approximately the total amount issued, but it is safe to assume that the bonds and warrants together amounted to at least $10,000,000 last year. A special road tax of 15 cents on the $100 property valuation may be issued by majority vote of the taxpayers, and in many counties this tax has been used for construction or maintenance. The regular road and bridge tax, levied by the commissioners' courts, is usually 15 cents on the $100 property valuation, and the total amount of the regular and special road taxes is probably over $5,000,000 a year. The labor tax, which is still in force in almost all of the counties, consists of 5 days' labor each year for all able-bodied males between the ages of 21 and 45 years, or a cash payment of $5, which is reduced to $3 if paid before February 1.

Unfortunately the Texas road laws form a great handicap to the proper administration of highways. Most of the general road laws were passed over 40 years ago, and there has been practically no change, except in the bonding law, since 1889. For example, the law provides that, "First-class roads shall be clean of all obstructions, and not less than 40 ft. nor more than 60 ft. wide; all stumps over 6 ins. in diameter to be cut down to 6 ins. of the surface and rounded off; all stumps 6 ins. and under to be cut smooth with the ground." The general road laws are so unsatisfactory that of the 251 organized counties in the state, about 140 are operating under special road laws which are enacted by the Legislature but apply only to the individual counties.

A RECENTLY COMPLETED CONCRETE ROAD IN HUNT COUNTY, TEXAS.

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*Professor of Highway Engineering, Agricultural and Mechanical College of Texas.

Control of Highway Work.—The unit of administration of highway work is the county, and control rests with the county commissioners' court. Each commissioner has charge of the roads in his own precinct, while all the road work in the county is supervised more or less by the county judge.

Any portion of a county may be organized into a road district for the purpose of issuing road bonds, and in that case citizens' committees are often appointed to act with the commissioners' court.

Much of the road construction is done without engineering supervision of any kind, but where there is a large bond issue an engineer is usually employed, and some of the larger counties have permanent engineering departments. When the engineer is employed on a salary basis he is usually paid from $1,800 to $3,000 a year. For a while, one county paid its chief engineer $450 a month. Much of the highway engineering is done on a percentage basis. The customary fee, in that case, to cover engineering and inspection, is 5 per cent. of the cost of the work, but some bids run as low as 2 per cent.

Although Texas has no state highway department as yet, the Agricultural and Mechanical College has maintained a highway department for the past six years, giving general advice to local road officials and making free tests of road materials. The University of Texas has had a road materials laboratory for about two years, and has made an extensive study of the road materials in all parts of the state. This laboratory also makes free tests for local officials. Recently an engineer from the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, was detailed to Texas to give general advice on highway problems. His headquarters are at Austin and his services are available to any community in the state.

Types of Construction.—There is a great difference in the climate, topography, soil and available road materials in the different parts of the state. The extreme eastern portion is heavily wooded, has a sandy soil, and an annual rainfall of over 50 ins., while the extreme western portion is hilly, almost treeless, and has an annual rainfall of less than 10 ins. Incidentally, it is as far from Beaumont to El Paso as it is from New York City to Chicago, and from Dalhart, up in the "Panhandle," to Brownsville, on the Rio Grande, is nearly as far as from Chicago to New Orleans. It is often said that there is nothing but a barbed wire fence between Dalhart and the north pole, while many men of the militia vow that there is less than that between Brownsville and the equator. With these distances in mind, one can easily imagine the varying climatic and soil conditions with which the Texas road builder must contend.

About one-third of the state, in the eastern part, contains at least two-thirds of the population, but has no road building material except gravel and sandstone, with deposits of mud-shell along the Gulf Coast. There is a great deal of sand and clay, but most of the sand seems to be too fine for good results in sand-clay construction. In the north central part there are a few deposits of limestone, and near the center of the state there is a large amount of granite and limestone and a little trap-rock. Unfortunately the center of the state is not the center of population and road building activities. In the southwestern part there is limestone, granite, trap-rock and rock asphalt, but the distance is too great to make any but the last named material of much general use. Most of the state is fairly well supplied with gravel, though some of it is not of very good quality.

The counties in which the cities of Ft. Worth, Waco and San Antonio are situated have built a good many miles of bituminous roads. Around Greenville, in Hunt County, about 40 miles of concrete roads have been built, and El Paso County is building concrete roads. A few miles of water bound macadam roads have been built in various parts of the state, where stone was available, and there is a considerable mileage of sand-clay roads. Along the Gulf Coast

A WELL LOCATED GRAVEL ROAD IN NAVARRO COUNTY, TEXAS.

A TEXAS SHELL ROAD NEAR THE GULF COAST.

most of the improved roads are of mud-shell. On the plains, in the western part of the state, the climate and soil conditions are such that graded earth roads give excellent service, while in a few sandy places in the southwest roads have been built of "bear-grass." With the exceptions mentioned above, practically all the hard-surfaced roads in the state are of gravel, amounting probably to over 80 per cent. of the entire improved road mileage. Perhaps 10 per cent of Texas roads have been surfaced.

Although many of the counties have excellent road systems, most of the improved roads radiate for a few miles in every direction from the county seats. Often the adjoining counties have no improved roads, and as a result there are almost no improved trunk highways in the state. The recently completed "post road" connecting Austin and San Antonio, a distance of 80 miles, is one of the most important through highways, and there are two or three other places where it is possible to travel about a hundred miles continuously on improved roads.

Concrete bridges are usually built in connection with the road improvements, and, especially in the neighborhood of San Antonio, "low water" bridges are extensively used. These bridges are above the water under all normal conditions, but are designed so that during unusual floods the water will pass over them. Traffic is seldom interrupted for more than a few hours in a year, and there is an immense saving in the cost of construction.

GRAVEL ROAD UNDER CONSTRUCTION ON THE CAMPUS OF THE A. & M. COLLEGE OF TEXAS.

McLennan County, of which Waco is the county seat, installed an excellent maintenance system as soon as the roads were completed. A few other counties have more or less effective maintenance systems, but in the vast majority of cases there is no adequate provision for the maintenance of the roads which are built by means of bond issues. The resulting waste of road funds is appalling.

Future Prospects.—That Texas is fully alive to the necessity for better roads, and is determined to have them, is attested by the millions of dollars being spent annually on new construction. The Texas Good Roads Association has been actively engaged for several years in the promotion of road improvements, and at a recent meeting in San Antonio there were over 400 delegates present from all parts of the state. The meetings of the County Judges and Commissioners' Association, which are held twice a year, are devoted largely to discussions of road problems. The Houston "Post," in cooperation with the Houston Progressive League, the Agricultural and Mechanical College, the National Highway Association, and the Overland-Houston Company, sent out a "flying squadron" consisting of several speakers who traveled hundreds of miles, holding meetings along the way and organizing local good roads clubs. The State Federation of Women's Clubs has taken an active interest in the good roads movement, and there are many highway associations in different parts of the state organized for the promotion of various trunk highways.

The mistakes which Texas has made have been due to misdirected energy rather than to any lack of interest in good roads, and the prospects of correcting these mistakes are very bright. The greatest need at present is, of course, a state highway department. A bill establishing such a department was passed by the legislature four years ago, but was vetoed by the governor. A similar bill was introduced two years ago, but did not reach a vote. The passage of the federal aid bill practically assures the establishment of a state highway department by the next legislature.

Under the provisions of the federal aid act this state will receive $4,000,000 of federal funds during the next five years. This means that at least $9,000,000 will be spent under the best engineering supervision, and probably used only on trunk highways. Judging by the past few years, the various counties and road districts will spend between $50,000,000 and $100,000,000 additional during the five years. Under the supervision of a state highway department this money will probably be spent much more wisely than road funds have been spent in the past, so that at the end of five years Texas will have a magnificent system of highways.

Unusually Complete Data on Available Road Building Materials were furnished contractors bidding on road work for which bids were received recently in Vermilion County, Illinois. All bidders were given maps showing approved sources of material in the portion of Indiana from which most of the concrete aggregates are expected to come. The Vermilion County work will be prosecuted with funds derived from a $1,500,000 bond issue.

A Reinforced Concrete Ribbed Arch Bridge with Rubble Masonry Facings has been built over Eagle Creek near Portland, Multnomah County, Oregon. The structure consists of a semi-circular arch of 60 ft. span composed of three ribs, carrying a 20-ft. roadway on floor beams of 10 ft. span resting on concrete spandrel columns. The concrete is concealed by 12-in. random rubble facing walls carried on a stone arch rings and tied to the outer arch ribs, spandrel columns and struts. The bridge cost $10,000, an amount reported to be less than would have been required for the construction of a stone arch because of the lack of suitable stone near the site.

Views of Safety Provisions In Massachusetts Road Work

Making provision for the safety of traffic in the construction and reconstruction of roads was discussed at some length and illustrated by several examples from actual practice in a recent issue of "Good Roads" ("The Element of Safety in the Construction and Improvement of Roads," "Good Roads," September 2, 1916, page 107). Since that article went to press, four interesting photographs showing provisions for safety on Massachusetts roads have been secured. These photographs are reproduced herewith.

Banked Curve and Lengthened Sight Line.

Banked Curve and Unobstructed View Ahead.

Long Sight Line and Banked Reverse Curve.

Sight Line Lengthened by Bench in Bank.

VIEWS SHOWING HOW TRAFFIC IS SAFEGUARDED ON MASSACHUSETTS STATE ROADS.

In the previous article attention was called to various methods of eliminating dangerous conditions, especially on curves. Among the remedies noted were the banking of curves and the lengthening of the sight line. The application of both of these methods is shown in the accompanying illustrations. While all four illustrations show roads on which the curves are banked to some extent, the banked curves are especially noticeable in the upper right-hand and lower left-hand photographs. Three of the illustrations—the two on the left and the lower one on the right—show methods adopted for lengthening the sight line. The upper left-hand illustration shows a curve in comparatively level but wooded country. The trees and underbrush on the inside of the curve have been so cut as to make it possible to see the road for a safe distance ahead. In the lower right-hand illustration is shown a less common method of securing the same result. In this case a bench has been made in the bank on the inside of the curve, thus providing a reasonably long sight line, but at the same time keeping down the amount of excavation.

In the lower left-hand illustration is shown a railroad and highway intersection at which the highway is carried under the railroad. The danger always present at an under-crossing where the road and railroad are not at right angles has been reduced in three ways: first, by making the distance between the abutments sufficiently great; second, by banking the curve, and, third, by so locating the road as to secure the maximum length of sight line. There is a statute in Massachusetts providing that on underpasses there shall be a clear vision along the center line of the roadway for a distance of 150 ft. at all points of the approaches to the underpass, unless special permission for a shorter sight line is granted by the state highway commission.

San Francisco's Newest Scenic Highway, the Twin Peaks Boulevard, is practically completed. The road encircles two hills known as Twin Peaks and is about two miles long. The roadway is 25 ft. in width with a rock shoulder 7 ft. 6 ins. wide on each side. The pavement consists of sheet asphalt with a 1½-in. binder course and a 1-in. top course, laid on a 6-in. concrete foundation

The Coleman du Pont Road in Delaware

By CHARLES M. UPHAM*

The completion of the first twenty miles of the Coleman du Pont Road places a new trunk line in southern Delaware. The location of the road is in the central part of the state beginning at the Maryland line and running in a northerly direction. With only four curves in a distance of twenty miles the straight alignment makes the distances between towns a minimum, and traffic that has formerly been obliged to meander over crooked county roads, deep with sand in summer and heavy and rough in winter, is now enjoying the benefits of a modern highway. Journeys that formerly were hardships on the traveler have become trips of pleasure. With the extension of about six miles of road in Maryland, the du Pont Road will then be connected with the Maryland system of improved highways. Not only has the du Pont Road opened up a new stretch of rich farming land but it has created an awakening in road improvement throughout lower Delaware.

The economic advantage of the road is fast being realized. Farmers and lumbermen have found that they are able to haul on the du Pont Road more than twice the loads that they can haul over the average county roads and are taking advantage of this. It is a common sight to see several teams hauling their loads to the du Pont Road and transferring them to a single wagon.

The natural resources in southern Delaware for permanent road construction are very few. The low, flat country without stone or gravel and containing mostly sand, clay and swampy material, immediately suggested, as the big problems, the transportation of construction material, and drainage. A traffic schedule was prepared and given to the railroad company, which took care that material was rushed to the work without delay. Approximately 53,000 tons of construction material were delivered in about six months.

A drainage survey that mapped all ditches and streams extending about a half-mile each side of the road made it possible to construct a design that takes care of the drainage satisfactorily.

Delaware is made up of various kinds of soils. In some sections the road passes through areas of drifting sand, while in others a stiff clay is encountered. Through the swamps a black humus is found, and in the low fields a black soil that becomes very hard in dry weather, but soft and slimy in wet weather. Because this latter material absorbs and retains large quantities of water, it has been replaced by more suitable subgrade material.

From the beginning the du Pont Road has served two great purposes. It has furnished a modern highway for traffic and afforded an opportunity to carry out many experiments on an extensive scale. The early experiments comprised the use of various kinds of asphalts or tars with the several aggregates. Several of these experiments are now four years old. The later experiments dealt with concrete pavement and included the effect hydrated lime has on concrete; the most economical length of slab; the various kinds of reinforcement; the different kinds of surface finish; the different methods of curing; the results of using different sands; the advantage of thoroughly mixing the ingredients; the use of various joints, etc.

On the completed part of the road there is a section of Hassam, a section of Warrenite, one of Amiesite and a larger section of reinforced concrete. The Hassam and Warrenite were laid in 1912, when the du Pont Road was first started. With slight repairs, both these pavements are in good condition. Part of the Amiesite pavement was laid on a concrete foundation and part on a crushed stone foundation. This pavement is about one year old and its appearance is excellent.

The greater part of the completed work on the du Pont Road is reinforced concrete. This concrete pavement is 14 ft. wide, 7 ins. deep in the center and 5 ins. deep on the sides, and is laid on a flat subgrade. It is reinforced in nearly all instances. The proportions of the ingredients were one of cement, two of sand and four of stone, with different quantities of hydrated lime up to 10 per cent., by volume. After considerable experimenting it was found that thorough mixing greatly increased the strength of the concrete, and while experiments showed an increase in strength by mixing up to 4 minutes it was considered most economical to mix the concrete for 1½ minutes. The results of the early tests might lead one to believe that there was no economy in longer mixing, but the long time tests showed a distinct advantage in the thorough mixing.

When deciding upon the length of slab that was to be used recourse was had to the concrete roads already built. It was found the length of slabs varied from 25 up to 60 and 70 ft. In many instances there were nearly as many cracks in the shorter slabs as there were in the longer ones. The question was naturally asked if a 60 or 70 ft. slab could be constructed and it could be shown that its length was not an injury to the slab, why could not this length be increased to 100 or 200 ft.? It was therefore decided to experiment on a large scale with this point in concrete road construction and to find where the cracks would come. Joints were placed only when the concrete mixers stopped for more than 15 minutes. The result was some very long slabs; the longest being 500 ft. So far the slabs have remained perfect with the exception of a few transverse cracks. While these cracks are not a serious injury to the road they are unsightly. The cracks generally appear in the longest slabs and their regularity seems to indicate a definite principle of contraction. By these various lengths of slabs it was learned what the longest slab, without cracks, could be as constructed under conditions as they are on the du Pont Road. Shorter slabs were used for the purpose of getting away from these cracks, and while this was accomplished it created a condition more serious than the cracks, that is, it increased the number of joints.

Great attention was paid to securing a smooth even surface. A power templet was used on one section and a very satisfactory surface was obtained except at the joints. On other sections a steel templet made of 4 by 4 by ½-in. angle iron was used and after the concrete was hand floated a smooth but irregular and somewhat unsatisfactory surface resulted. This was remedied by a second templet that was kept about 8 ft. in the rear of the first templet. The second templet consisted of a float about 14 ins. wide and of the same shape as the crown of the pavement. This rested on the forms and was drawn with a longitudinal motion. The result was a smooth surface. Care was exercised to float the concrete as little as possible in order to keep the stone aggregate near the surface.

After the concrete was finished it was protected by canvas covers until the concrete was hard enough to hold a covering of earth which was kept soaked with water for 14 days. This cover was not removed until after 30 days. A short time was then allowed for the concrete to harden in the air before allowing any traffic on it.

Especial care was taken to insure satisfactory ingredients. The Bureau of Inspection, Wilmington, Delaware, tested all the materials and carried on considerable experimenting throughout the entire work.

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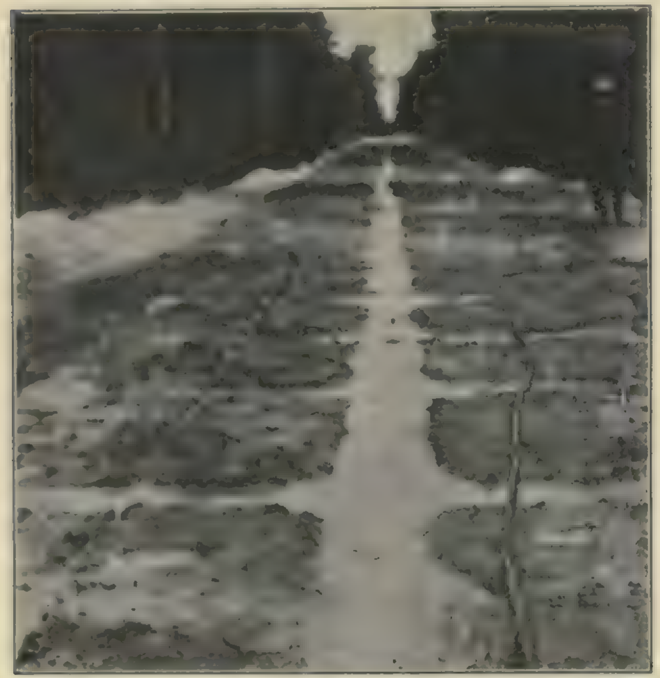
*Chief Engineer, Coleman du Pont Road, Inc., Georgetown, Delaware.

The stone used was a trap rock graded betwen ¼ in. and 1½ ins. The French coefficient of wear averaged 17. The sand was a dredged river sand and especially well graded up to ¼ in. The larger particles of sand were about the same size as the smallest pieces of stone, thus making a graded mixture from the 1½-in. stone, to the finest particles of sand.

Five different brands of Lehigh Valley cement were used. The cement was tested at the mill and arrived at destination ready for use.

The experiments with hydrated lime were especially interesting. In the laboratory the lime seemed to increase the strength of concrete made from some sands, but was detrimental to others. In the field it was noted that as the amount of lime was increased, up to 10 per cent., the percentage of transverse cracks was reduced. Disregarding the slight increase or decrease of strength in the concrete due to the hydrated lime, it seems to assist in the construction by making the concrete flow more freely and preventing segregation of the coarse aggregate. It is possible that the hydrated lime assists the prevention of transverse cracks inasmuch as the lime-cement concrete retains moisture longer and thus does not contract as much during the first 24 or 48 hours while the concrete is getting strength, a period that starts the greater number of the transverse cracks.


METHOD OF CURING CONCRETE PAVEMENT ON LEVEL SECTIONS—COLEMAN DU PONT ROAD.

During the early spring when the concrete was saturated and thus expanded and when the expansion was at its maximum due to the temperature, a number of the slabs rose at the joints causing an abrupt unevenness. The greatest rise was 1¼ ins. After the concrete became dried out nearly all of these slabs returned to their original positions. This uneven condition was not observed at a single crack, therefore, it was decided that under the prevailing condition it would be more economical to maintain the cracks and do away with a chance of a movement at the joints and it was decided to no longer restrict the length of slab, but to make it as long as possible.

Nearly all joints were protected by protection plates. This was found to be a decided advantage during the spring while one slab was slightly above the other, for when the traffic hit the higher slab the plate would protect the edge of the concrete from abrasion. Some joints were made of bituminous filler only, while some were butt joints having no filler or plate. A few of the slabs having the butt joints were reinforced across the joint with steel rods. This keeps the joint from opening and gives it the appearance of a fine crack. Where this was done the resulting slab was 1,240 ft. in length.

CONCRETE MIXER AND FINISHING TEMPLET ON A CONCRETE PAVEMENT ON THE DU PONT ROAD.

It is difficult to decide whether or not the reinforcement used has been an economic advantage. It is claimed by the manufacturers of paving reinforcement that the reinforcement does not prevent cracking, but it does prevent the cracks from opening. This may be true during the greater part of the year, but in the fall after a continued dry spell and when the temperature suddenly drops the reinforcement does not prevent the opening of the cracks, especially in the longest slabs. If all the slabs were short the reinforcement would undoubtedly prevent the cracks from opening. More time is necessary in order to thoroughly study the advantage of reinforcement under these conditions. While the smaller experiments indicate that reinforcing reduces the number of cracks, the larger experiments do not seem to confirm this

Daily records of all materials used and methods followed were sent to the main office where they were tabulated on large charts. By this means a complete record of all the construction has been kept. These charts show the kind of materials used, the proportions and the methods in which it was used; the nature and condition of the subgrade; drain-

COMPLETED CONCRETE PAVEMENT ON A 5-MILE TANGENT —DU PONT ROAD.

age; the number of bags of cement used, etc., and also the maximum and minimum temperatures for the day.

The testing engineer completed these records by taking samples of the materials and testing them, chiefly to insure their quality, but also to make the records complete. The inspection was thorough and carried on by capable men of wide experience. To the inspection and testing of materials is due the credit for the excellent work that has been done.

The next section of the du Pont Road will be extended in a northerly direction to the Town of Milford. This will complete the du Pont Road in Sussex County and will mean that more than one-third of the road has been constructed through the entire state.

The road is a gift to the State of Delaware by T. Coleman du Pont, and will be presented to the state upon its completion.

Experimental Research with Road Building Materials*

By **H. K. BENSON**†

The great variety of materials somewhat indiscriminately used in the building of roads has suggested the possibility of applying the spirit of scientific research to them in a manner analogous to that by which it is applied to materials used in the manufacturing industries. The practical man often looks with disfavor upon the so-called experiments of science since usually he forgets to learn the real value of the unsuccessful experiment. The writer well remembers the statement of Dr. Remsen, the great American pioneer chemist, that it is one of the tragedies of science that the failures of scientific research are not recorded. In other words we often learn more of the basic facts underlying a given problem from what we are unable to accomplish than from the things which actually are done. The failure of a given attempt should not, therefore, be accounted as loss but rather as a contribution to the total sum of knowledge which has accumulated about a particular subject. * * * This experience brings me to the main object of my appearance before your body—to plead for the scientific scrutiny of all road building work. The time has, of course, gone by for the annual festival when the neighbors all gathered by the roadside to "work out" their road taxes. How well I remember the pleasant times we used to enjoy on those occasions! We now import from distant places, carefully manufactured commodities and out of them our roads are being constructed. The operation is costly and for this reason has its limitations. If it is true that we are passing through a transitional stage, then every bit of evidence collected and put on record will hasten the passage from the present stage to the final or ideal road of the future. What do we understand by scientific scrutiny? First there is involved a complete record of construction of every type of road during construction, then a continuous record of inspection during the life of the road and a final drawing of conclusions as to the good and bad qualities of a given type of construction. This involves an organization which is not subject to change as periodically as county officials come and go. Next in this program is an aggressive movement to profit from the advances of science through the adoption of new materials and new methods of construction and their subjection to service tests and record. This requires a willingness to consider road problems with an open mind—to admit that the present materials and methods are transitory. Even in the maintenance of roads, it involves the trying out and testing of methods. Some county commissioners believe that the only method of maintaining an earth road, for example, is to periodically haul gravel upon it and then after it is full of mud holes, to haul some more gravel. It is granted that every official has a right to his convictions, but would it not be conducive to a better state of knowledge to try out the patrol system, in a certain district for a term of years—the use of the drag in another district—the gravel method in another, and so on? It is admitted that such a policy would smack of experimentation—that road officials did not know in their own minds what is best—admissions which in the writer's opinion are the beginning of wisdom.

Experiments conceived in a knowledge of exact conditions, pursued along exactly defined lines and concluded with definite results have inaugurated some of the world's greatest industries. It is not unreasonable to believe that the same procedure will establish for us the means for building the highways upon which great multitudes pass back and forth to exchange commodities and increase the volume of trade.

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*Extracts from a paper entitled, "Experimental Research as Applied to Road Materials," presented at the annual convention of the Washington State Association of County Engineers, Tacoma, Wash., September 14-16, 1916.

†Director, Bureau of Industrial Research, University of Washington, Seattle, Wash.

The Work of the British Road Board During the Past Fiscal Year

The net amount of payments made by the British Road Board during the fiscal year ending March 31, 1916, was £429,375, a decrease of £863,532 as compared with the sum for the preceding fiscal year. The gross expenditure for the fiscal year of 1915-16 was £609,244, divided as follows: Administrative expense, £15,764; paid under grants, £499,157; paid under loans, £94,323. The difference between the gross and the net expenditures is accounted for by loans unpaid amounting to £179,869. These figures are from the sixth annual report of the Road Board, note of which is made elsewhere in this issue.

Applications for advances made during the past fiscal year are shown in the following table:

	Estimated Amounts of Advances Applied for			
Character of Work	England and Wales	Scotland	Ireland	United Kingdom (Total)
Improvement of road crusts..	£255,833	£36,964	£4,241	£297,038
Widenings, diversions, and the improvement of grades, curves and corners........	4,187	218	....	4,405
Reconstruction and improvement of bridges..........	3,375	....	....	3,375
New roads and bridges......	5,443	....	....	5,443
Totals	£268,838	£37,182	£4,241	£310,261

The advances applied for during the fiscal year of 1915-16 were less by £1,691,003 than those applied for during the preceding fiscal year and £2,283,544 less than during the fiscal year of 1913-14. The smaller amount applied for, according to the report, is due to the reduced amount of work undertaken by highway authorities as a consequence of the war.

Since the establishment of the Road Board, its receipts have amounted to £7,240,195, of which £4,075,608 have been received from duties on fuel for motor-driven vehicles, £2,786,809 have been received from carriage licenses, and the remaining £377,778 represents interest and profits on investments and loans. During the same period the Road Board has expended £75,919 for administration and has paid £2,658,146 under grants and £980,103 under loans. Loans to the amount of £305,239 have been repaid, leaving a net expenditure, for about five years, of £3,408,929.

Road Oiling at a Rate of .75 Mile Per Day has been done in California state work this season, according to reports. The oil was put on by motor-driven distributors, in two applications. Six cars of oil were used and 18 miles of road were covered in 24 working days. One of the factors largely responsible for the rapid progress was the careful provision made for distributing the screenings used to cover the oiled surface.

The Location of Highways[*]

By JAMES ALLEN[†]

A road may be bad in every other particular; the roadbed may be narrow and rough; but if the alignment is right the other defects will, with time and money, be remedied. A narrow roadbed will be widened out, and a surface of gravel or crushed rock placed on it, gradually making these roads first-class highways; but if a road is not properly located, if the alignment is poor and the grades heavy, the only thing to do is to abandon what work has already been done and relocate. This is being done in every county in this state with our old roads. Surely it should not be necessary for the next generation of road builders to throw away all the work we are now doing at such an enormous cost in time and money, and relocate the roads we are building today. Also our trunk roads and main laterals are being hard-surfaced as fast as possible, and every new road located at this time should have this in view.

Unlike the railroad locater, the highway engineer has no Wellington to guide him, and any such data, if collected, would be so vague and theoretical that I doubt very much if they could be put to any practical purpose. There are a few general rules, however, which can and should be followed.

First, I believe the most important, is the alignment. No new work should be laid out with sharp, dangerous curves, and all such on our old roads should be eliminated as fast as possible. Where it is not practicable to do away with bad curvature altogether (and there are any number of places where the cost would be prohibitive), the roadbed should be widened so as to make the road as safe as possible. Some of our text-books and some engineers have arbitrarily placed the minimum length of radius at 100 ft., but I do not believe that common sense will justify such pactice. We all know of roads where curves with a radius of 150 ft. are more dangerous than those with a radius of 80 ft. The whole question is one of sight. Where the line makes around a nose and the sight is bad, money should be spent to make these places as safe as possible, in the first place by getting as long a radius as possible, or as I said before, widening the roadbed. Where the line makes a draw, running up on one side and down the other, and a car can be seen for a long distance either way, the radius can be shortened. These short radius curves are not dangerous per se and only become so when made at a high rate of speed. And right here it might be well to mention that no amount of money is going to make our roads fool-proof. Any road, no matter how well laid out and constructed, is dangerous so long as the law against speeding is not enforced. I believe you commissioners should, at this meeting, take this matter up and by concerted action see that the legal speed limit of 30 miles an hour is enforced in your counties. There is not enough money in the State of Washington to keep our gravel roads up so long as big automobiles, stages and heavy machines are allowed to tear over the country at 40, 50 and 60 miles an hour, to say nothing of the danger to others who have to use these roads for business and pleasure.

The other day I heard a man bragging about making a run from North Yakima to Seattle, a distance of 178 miles, in 4 hours and 52 minutes, which is an average speed of over 35 miles per hour, or 5 miles over the legal speed limit. To do this he must have at times traveled at the rate of 60 miles per hour, and the damage done to the roads and the dangers to others using this road must have been great. This should be stopped.

After the alignment come the grades. It seems to be generally accepted that the grade on a road should not exceed 5 per cent., and this is a good rule to follow. There are places, however, where the cost of a 5 per cent. grade is prohibitive, and the engineer is justified in using short sections of 6 per cent. and 7 per cent. grades to carry the line oved bad places and on to better ground, thereby saving thousands of dollars, and in no way destroying the carrying capacity or the safety of the road. Never lay a flat grade through a cut, and avoid as far as possible sharp curves at the foot of a maximum grade.

The next in importance is distance. Don't wind your road all over the country to please everybody. You can't do it anyway, and remember every foot in distance saved is money saved, not only on first cost, but when it becomes necessary to hard-surface.

Every road is a problem of its own and has to be so considered. The only thing an engineer has to go by is just good, hard, common sense, and right here it might be well to add that any engineer without this ingredient is an abomination. One thing about doing this public work is that the theorists and impractical engineers are apt to get into control. This class of engineers is long on talk but short on performance, and if they were not on some public pay roll would starve to death, for the railroad companies and big corporations won't have them. If we have done nothing else in the past three years, we have at least kept this class of engineers out of the Highway Department, and I believe the state has about as practical a corps of engineers working for it as it is possible to get. Every man is judged by the results he gets and by nothing else, and every fair-minded man will say that in the past three years the state has been getting results in road building. Take the big men in the engineering profession, and, outside of the profession, not one man in a hundred ever heard of them. Take in our own state: How many of you here can name the chief engineer of the N. P. Ry., or the C. M. & P. S., or the O.-W. R. & N., or the Great Northern? Yet millions of dollars have been spent in this state under the direct supervision of these capable men and their assistants. These men are not given to blowing their own horns, and, not coming in direct contact with the public, are never heard of.

In highway engineering all this is changed. The highway engineer comes in direct contact with the general public. If he makes mistakes—may the Lord have mercy on his sinful soul! Every dotor, lawyer, editor, merchant, real estate agent, secretary of a commercial or an automobile club (especially the latter) can do it so much better than we can and at half the cost! I have had men tell me they could build a road for $2,500 a mile, which cost the state that much to clear and grub. Every man you meet has some theory of his own about how things should be done, but no one is wise enough to tell you where to get the money necessary to put all these scheme into practice.

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[*] Extract from a paper on "The Location and Construction of our State Roads and the Relation of the Highway Department to the County Commissioners" presented at the annual meeting of the Washington State Association of County Commissioners, Tacoma, Washington, September 14-16, 1916.

[†] State Highway Commissioner of Washington.

Uniform Traffic Laws in all parts of the country are being urged by the American Automobile Association. The problem is stated, and the policy to be pursued is outlined in a recent statement by Chairman Yellott of the Legislative Board of the A. A. A. In this statement attention is called to the increase in the production of motor vehicles with the resulting increase in motor traffic both on country roads and city streets; to the mileage of improved roads added to the country's road system each year; and to the increase in the number of inexperienced persons authorized to operate motor vehicles on the public highways. The Legislative Board plans to gather suggestions for use in framing a set of uniform traffic regulations for presentation to the association.

Highway Improvement in Kentucky

By RODMAN WILEY*

Kentucky was one of the first states in the Union to have a highway commission, such an organization having been in existence as early as 1810. Some very fine roads were built under the direction of those early engineers. Many of the roads were provided with telford bases of widths up to 18 ft., with light grades and easy curves, and with drainage structures up to those of moderate spans built of dry masonry. With the advent of the railroads in the 30's there came a decrease in the attention paid to the building of roads, and for about 75 years road work was carried on in a very haphazard manner.

Realizing that road building was an engineering problem and that millions of dollars were being wasted through inefficient management, the state legislature at the 1912 session established a highway commission and appropriated $25,000 to pay its expenses. Provision was also made for a road fund to be obtined from the sale of automobile licenses. The duties of the department, as defined by this act, were largely advisory. So much work was done wherever the engineering advice of the commission was accepted and so much interest was aroused in the road problem, that at the 1914 session of the legislature a state aid law was adopted and an inter-county seat road system was established. The financing of the work was taken care of by the levying of a 5-ct. tax on every $100 worth of taxable property, and this with the automobile license fund which had been accumulating since 1912, brought the state aid fund during 1915 to approximately $750,000. The work was started late and was carried on with considerable difficulty because few of the counties understood how to operate under the new law. But in spite of these hindrances about 800 miles of roads were surveyed and let by contract, and about 450 miles of the roads were completed at a cost of something like $1,350,000.

A REINFORCED CONCRETE THROUGH GIRDER BRIDGE, 36-FT. CLEAR SPAN, CARRYING A 16-FT. ROADWAY—McCRACKEN COUNTY, KENTUCKY.

The road season in Kentucky lasts for about eight months —from about April 1 to about December 1. The season this year has been more favorable than last year because of less rain, and it is expected that contracts for the construction of several hundred miles of roads will be let before the close of the season. In the past, some of the counties have waited too long before taking definite action so that contracts have had to be awarded late in the summer. It is hoped, however, that in the future surveys will be made in all of the counties during the winter and contracts awarded in the early spring so that the work started may be completed during the season.

All types of roads are being built in the state but the greatest expenditures are made for new macadam construction and for macadam resurfacing. In the western part of the state there are large gravel deposits, and many roads are being built of this material. In the central portion macadam is the predominating type. In the mountains where there were no roads it was considered best to complete the grading and build the drainage structures before attempting to surface the roads. There are enormous deposits of rock asphalt in the state and this material has been used for road work with entirely satisfactory results. Because of the heavy automobile traffic through the Blue Grass section most engineers deem it unwise to expend money for laying water bound macadam roads and the day is not far distant when such roads will be given bituminous treatments.

The present laws make no provision for maintenance, but some of the counties have started a patrol system and all county officials are being encouraged to maintain the roads, at least those which have been built under the state aid plan.

Considerable attention is paid to bridges and culverts, and

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*Commissioner of Public Roads of Kentucky.

A CONCRETE PAVED STATE AID ROAD IN KENTON COUNTY, KENTUCKY.

for all spans up to 30 ft. reinforced concrete is being used. The structures are designed to carry 15-ton traction engines with the proper factor of safety and impact allowance, the minimum width of roadway being 16 ft. These loading conditions are considered sufficiently severe to meet the needs of the state in the future as well as at present. For spans of from 30 to 40 ft. reinforced concrete through girder spans are used, or, if funds are available, T-beam spans are built. For spans of 40 ft. and over, steel trusses with either concrete or wooden floors are provided. Due to the fact that the old 3-in. plank floors have not given the service desired of them, all wooden floors now built consist of 2x4-in. planks sized on one edge, set on edge and spiked together every 2 ft., all points of contact being covered with tar paint and the floors being toe-nailed to nailing strips on top of the floor beams. This construction provides a very rigid floor, which, it is believed, will have a life of about 12 years. In the future all truss bridges will be designed to carry concrete floors, even though wooden floors are used temporarily.

At the 1916 session of the legislature there was passed a law under which convicts can be worked on the roads, the guarding and care of the men being directly under the supervision of the Board of Prison Commissioners, and the work under the direction of the Department of Public Roads. Work under this plan is now being done in Bell County, where the bond issue funds were exhausted before the completion of the road system. The county being well equipped with machinery and quarters for the convicts, about 75 were placed there on August 6 and are now engaged in surfacing about 7 miles of road between Pineville and Middlesboro. When this work is completed there will be an excellent road between the two places, a distance of about 14 miles through a very beautiful country. Since all classes of labor are usually found in the prison, only a short time is necessary for the organization of a very efficient gang which can perform all sorts of road work, even the erection of steel bridges. Under the terms of the law, the State Board of Prison Commissioners receive one dollar per day for each man while engaged in the work, and the State Highway Department is allowed to use 10 per cent. of the road fund for the purchase of machinery necessary to build roads under the act. The department is also allowed to do work to an amount equal to 15 per cent. of the state aid road fund.

A BRICK PAVED HIGHWAY BETWEEN ASHLAND AND CATLETTSBURG, KENTUCKY.

The state road law makes it possible for the State Commissioner of Public Roads with the approval of the Board of Sinking Fund Commissioners to cooperate with the federal government in any way necessary for receiving federal aid. Because of the fact that some little time is required for the preparation of plans and other preliminary work it has been though best for the state to make all preparations this winter for using both the 1916 and 1917 federal aid allotments next year. This means that practically $600,000 will be expended under this plan next season.

A THREE-SPAN STEEL TRUSS BRIDGE DESIGNED AND BUILT UNDER THE DIRECTION OF THE KENTUCKY DEPARTMENT OF PUBLIC ROADS.

On the whole it may be said that the people of Kentucky are alive to the importance of good roads and that the state aid plan is proving wonderfully successful.

Roads to Be Improved in Brooke County, West Virginia, under an $800,000 bond issue, will have a total length of about 75 miles instead of 15 miles as was reported in "Good Roads" for September 16.

A Single Track Road about six miles long has been built near Syracuse, N. Y., by the State Highway Department. The one track consists of a concrete pavement 8 ft. wide placed at one side of the center line of the road. So far as cross section is concerned, the pavement is a half of a 16-ft. pavement. This construction makes it possible to lay another 8-ft. strip at some future time if it is needed, thus completing a 16-ft. pavement. The work has been done on a road on which practically all the loads are hauled in one direction, the concrete pavement, of course, being laid on the side carrying the heavy traffic.

Rules and Regulations for the Prosecution of Highway Work with Federal Aid

The United States Department of Agriculture has recently issued as Circular No. 65, the rules and regulation adopted for carrying out the federal aid road act. There are two sets of rules and regulations, one referring to all portions of the act, except section 8, and the other referring to section 8 which relates to the improvement of roads in the national forests.

In "Good Roads" for August 19, under the caption, "State Highway Officials' Association Meets to Discuss Tentative Rules for Federal Aid Act," were printed the tentative rules for the carrying out of all sections except section 8. The final draft as set forth in Circular No. 65, is practically the same as the tentative rules previously published in these columns. Such changes as have been made, with the exception of those affecting only phraseology, are noted in the following paragraphs, the left-hand column containing the tentative rules as printed in the issue of August 19, and the right-hand column the final draft as printed in Circular No. 65:

Regulation 1.—Definitions

(Not included in original draft).	Sec. 5. **Authorized representatives of the Secretary.** The Director of the Office of Public Roads and such other officials and employees thereof as he may designate from time to time.

Regulation 4.—Project Statements

(The sentences in opposite column not included in tentative draft).	Sec. 1. * * * With each statement there shall be submitted for the approval of the Secretary copies of the form of contract, together with all documents referred to therein or made part thereof, and of the contractor's bond which it is proposed to use on the project. No alteration of such forms shall be made until it is approved by the Secretary.

Regulation 5.—Surveys, Plans, Specifications and Estimates

Sec. 6. No part of the expense of making preliminary surveys, plans, specifications or estimates prior to the acceptance of the project by the Secretary, by or on behalf of the state, shall be included in the estimate or paid by the federal government.	Sec. 6. No part of the expense of making surveys, plans, specifications, or estimates, by or on behalf of the state prior to the beginning of construction work, shall be included in the estimate or paid by the federal government.

Regulation 7.—Contracts

Sec. 1. Prior to the approval of the first project in a state, copies of the forms of the contracts, together with all documents referred to therein or made part thereof, and of the contractor's bonds proposed to be used under the Act shall be submitted to the Secretary. No alteration of such forms shall be made until it is approved by the Secretary.	Sec. 1. No part of the federal money set aside on account of any project shall be paid until it has been shown to the satisfaction of the Secretary that adequate means, either by advertising or by other devices appropriate for the purpose, were employed, prior to the beginning of construction, to insure the economical and practical expenditure of such money.
Sec. 2. Before work is begun on any project, adequate means, either by advertising or by any other devices appropriate for the purpose to make certain that the federal money set aside for the project is spent in the most economical and practical way to accomplish the objects for which it was appropriated.	(Omitted from final draft).

Regulation 8.—Construction Work and Labor

Sec. 4. No part of the money apportioned under the act shall be used directly or indirectly, to pay, or to reimburse a state, county or local subdivision for the payment of, any premium or royalty on any patented or proprietary material, specification, process, or type of construction, unless the work is open to actual competitive bidding.	Sec. 4. No part of the money apportioned under the act shall be used directly or indirectly, to pay, or to reimburse a state, county or local subdivision for the payment of, any premium or royalty on any patented or proprietary material, specification, process, or type of construction, unless purchased or obtained on open actual competitive bidding at the same or a less cost than unpatented articles or methods equally suitable for the same purpose.
Sec. 5. The supervision of each project by the State Highway Department shall include adequate inspection throughout the course of construction, to be paid out of the ten per cent. fund.	Sec. 5. The supervision of each project by the State Highway Department shall include adequate inspection throughout the course of construction.

Regulation 11.—Office of Public Roads

Sec. 2. The Director of the Office of Public Roads, and such other officials and employees thereof as the Director, from time to time, may designate for the purpose, shall be deemed the authorized representatives of the Secretary within the meaning of that phrase as used in these regulations.	(Omitted from the final draft).

The rules and regulations for the administration of Section 8 of the Act which have not previously appeared in "Good Roads" are as follows:

Regulation 1.—Definitions

For the purpose of these regulations the following terms shall be construed respectively to mean:

Section 1. **Act.** Section 8 of an Act of Congress entitled, "An Act To provide that the United States shall aid the States in the construction of rural post roads, and for other purposes," approved July 11, 1916 (Public—No. 156—64th Congress).

Sec. 2. **Secretary.** The Secretary of Agriculture of the United States.

Sec. 3. **Office of Public Roads.** The Office of Public Roads and Rural Engineering of the United States Department of Agriculture.

Sec. 4. **Local authority.** The State, Territory, or county jointly or severally making application for the survey and construction of a road or entering into a cooperative agreement with the Secretary.

Sec. 5. **State.** Any State or Territory.

Sec. 6. **Road.** A road, trail, or bridge.

Sec. 7. **National Forest Road.** A road constructed or to be constructed in cooperation with the local authorites under the direct supervision of the Secretary of Agriculture, and paid for in whole or in part out of moneys made available by the Act.

Sec. 8. **Cooperative Road.** A road constructed or to be constructed under State, Territory, or county supervision and under cooperative agreement as provided in the Act, but paid for out of funds other than those appropriated by the Act.

Sec. 9. **Construction.** Reconstruction and improvement of roads as well as original construction.

Sec. 10. **Maintenance or Properly Maintain.** The making of needed repairs and the preservation of a reasonably smooth surface, considering the type of road, but not extraordinary repairs or reconstruction.

Sec. 11. **State Highway Department.** Any department of another name, or commission, or official or officials, of a State empowered, under its laws, to exercise the functions ordinarily exercised by a State highway department.

Regulation 2.—Apportionment

Section 1. Ten per centum of each annual appropriation shall be withheld as a special fund, from which, as directed by the Secretary, the apportionment to any State as hereafter provided may be increased and from which there shall be paid such amounts as the Secretary may find necessary for the general administration of the provisions of the Act. The remaining ninety per centum of each annual appropriation shall be apportioned to the States as follows: One-half on the basis that the aggregate area of the lands of the United States in the National Forests in each State bears to the total land area of such State, and one-half in the proportion that the estimated value of timber and forage resources of the National Forests in such State bears to the total value of timber and forage resources of the National Forests of all the States: Provided however that in such apportionment the States of Florida, Michigan, Minnesota, Nebraska, North Dakota, and Oklahoma shall be considered as a unit of apportionment, and the States within which lands have been acquired by the United States under the provisions of the Act of March 1, 1911 (36 Stat. 961), entitled, "An Act to enable any State to cooperate with any other State or States or with the United States for the protection of watersheds of navigable streams, and to appoint a commission for the acquisition of lands for the purpose of conserving the navigability of navigable rivers," known as the Weeks Law, shall also be considered as a unit of apportionment.

Sec. 2. The apportionment for the fiscal year ending June 30, 1917, shall be made as of the date of the approval of these regulations, and on or before the first day of January next preceding the commencement of each succeeding fiscal year the Secretary will make like apportionment for such fiscal year.

Sec. 3. Any amounts apportioned to the States as herein provided remaining unexpended for a period of three years after such apportionment, may be reapportioned by the Secretary to the several States in the manner provided for original apportionment.

Regulation 3.—Applications

Section 1. Application for the survey, construction, and maintenance of roads under the Act shall be made by the proper local authority to the Secretary, upon forms furnished by the Forest Service, and filed in the district office of the Forest Service for the district within which the proposed road is located. Any application by a county in a State having a State Highway Department shall, before filing be referred to such department for its recommendation, which shall be filed with the application.

Sec. 2. Applications for the fiscal year ending June 30, 1917, shall be filed on or before October 1, 1916, and for each succeeding fiscal year on or before the first day of January next preceding such fiscal year.

Sec. 3. Each application shall contains: (a) Satisfactory evidence of authority to make application on behalf of the State, Territory or county, and to enter into a cooperative agreement with the Secretary for the survey, construction and maintenance of the proposed road; (b) a statement of the public needs to be served by the proposed road and the manner in and extent to which such road is necessary for the use and development of the resources upon which communities within or adjacent to the National Forests are dependent; (c) a statement showing (1) the general location of the proposed road, (2) its termini, length, grades, and estimated cost, and (3) the name, population, and location with respect to the proposed road of each community that would be benefited thereby; and (d) proposals for cooperation, giving in detail the amount and extent of the cooperation offered, whether in money, materials, labor, or the construction of a cooperative road, and whether cooperative moneys will be held and disbursed by the local authority or will be deposited in the United States Treasury in accordance with the provisions of the Act of Congress approved June 30, 1914 (38 Stat. 415, 430), entitled, "An Act making appropriations for the Department of Agriculture for the fiscal year ending June 30th, 1915," creating a special fund of contributions for cooperative forest work, available until expended, for the payment of the expenses of such work and for refunds to the contributors of amounts paid by them in excess of their share of such work.

Sec. 4. Applications which are not approved for the fiscal year for which made will be retained and, unless modified or withdrawn by the applicant will be considered for succeeding fiscal years.

Regulation 4.—Selection of Projects

Section 1. The Forest Service shall prepare: (a) A project plan for each State providing, as far as practicable, for a comprehensive road system in the National Forests, showing, in the order of their importance, the roads within or partly within the National Forests which it believes should be constructed; (b) maps showing the road system for each National Forest, and delimiting the projects listed, as provided in section three hereof, with a mark or marks of identification for each, and (c) a statement for each county in which there is a National Forest, showing the maximum amount which may be expended therein under the Act. Such project plans, maps and statements shall be submitted to the Secretary for approval, and after such approval shall be transmitted to the Office of Public Roads for its information.

Sec. 2. Unless satisfactory data are already available, reconnoissance surveys and preliminary cost estimates shall be made, by or under the direction of the Office of Public Roads, of all road projects for which proper application has been made.

Sec. 3. A list of the projects applied for, arranged as to each State in the order in which construction is recommended, shall be forwarded each year for presentation to the Secretary. The project list as approved by the Secretary shall determine the order of construction for each year.

Regulation 5.—Cooperative Agreement

Section 1. Upon the approval of any project list, a cooperative agreement for execution by the Secretary and the local authority shall be prepared by the Solicitor from data furnished by the Forest Service and the Office of Public Roads for each of those projects, in the order listed, for which funds are or will be available, and shall provide for: (a) Surveys, plans, construction and maintenance of the project to be done in accordance with these rules and regulations; (b) amount, value and character of cooperation; (c) furnishing of labor and materials, the deposit of cooperative funds in the Treasury, or the disbursement of such funds by the local authority; (d) supervision and inspection during construction and approval upon completion; (e) final accounting to each party to the agreement of all labor or materials furnished and all moneys expended under the agrement; and (f) such other terms as in the opinion of the Secretary should be included.

Sec. 2. The basis of cooperation shall be the reconnoisance survey estimate of the cost of final survey and construction. Cooperation shall be expressed as far as feasible in percentages. If the location survey estimates exceed the reconnoissance estimates by twenty-five per centum or more, the Secretary shall so notify the local authority, and at any time within thirty days either party to the agreement may apply for a modification thereof. If modifications can be agreed upon, a supplementary agreement, if necessary, shall be drawn; otherwise, either party may withdraw from the agreement upon thirty days' notice. In case of such excess, construction shall not be started nor advertisements made for bids until final agreement is reached.

Sec. 3. Each local authority will be required to cooperate as herein defined in an amount at least equal to fifty per centum of the estimated cost of the final survey and construction and the entire cost of maintenance of National Forest roads, unless a satisfactory showing is made to the Secretary that such an amount of cooperation is inequitable. Cooperation by local authorities may be in the form of money, labor, materials, or the construction of cooperative roads, and the amount and value thereof shall be fixed by the Secretary. Cooperation in the form of road construction will be accepted only when such cooperative road connects with and is an extension of a National Forest road, and to the extent only that such road is necessary to furnish a connection between a National Forest road and the general State, Territory, or county road system. Such cooperative road may be either within or without National Forest boundaries.

Regulation 6.—Surveys, Construction, and Maintenance

Section 1. Upon the execution of a cooperative agreement the Office of Public Roads shall proceed with the survey and construction of the road in accordance with such cooperative agreement.

Sec. 2. National Forest roads shall be constructed under the supervision of the Office of Public Roads, in accordance with plans prepared by it and approved by the Forest Service. The maintenance of such roads shall be under the supervision of the Office of Public Roads, unless otherwise provided in the agreement.

Sec. 3. Cooperative roads shall be constructed in accordance with plans made as provided in the cooperative agreement and approved by the Office of Public Roads and the Forest Service. Such roads shall be subject to approval by the Secretary on completion, and to inspection by the Office of Public Roads during construction and maintenance. Cooperative roads shall be maintained by the local authorities.

Sec. 4. If a cooperative road is not constructed as provided in the preceding section, or any road constructed under a cooperative agreement is not properly maintained in accordance with its terms, or there is failure to comply with any other of its terms, the Secretary will give notice of such fact to the proper local authority. If within four months from the receipt of such notice the terms of such agreement are not complied with, the Secretary will thereafter refuse to enter into any other cooperative agreement with such local authority until compliance has been made with the original agreement.

Regulation 7—Accounting

Section 1. All Federal funds expended for road construction under the Act, and all cooperative funds which may be deposited in the United States Treasury in accordance with the Act of Congress approved June 30, 1914 (38 Stat. 415, 430), mentioned in section 3 of regulation 3, shall be disbursed as directed by the Secretary of Agriculture.

Sec. 2. Cooperative funds used for the survey and construction of National Forest roads, but not deposited in the Treasury, shall be disbursed by the local authority only upon vouchers approved by the Office of Public Roads.

Sec. 3. A separate account shall be kept, as directed by the Secretary, of all moneys disbursed for National Forest roads, showing the States and counties within which, and the projects upon which such moneys have been expended, and the Secretary will furnish to the local authorities a detailed statement of such expenditures as soon as practicable after the completion of every project.

Sec. 4. Unless otherwise directed by the Secretary, records of the costs of survey and construction of all road projects, whether cooperative or National Forest roads, shall be kept upon forms to be supplied by the Office of Public Roads. If the Secretary shall so direct, progress statements or reports shall be submitted from time to time to the Office of Public Roads on forms supplied by that Office, and within ninety days after the completion of a project the local authority shall submit to the Secretary a final report of the project on a form supplied by the Office of Public Roads.

Sec. 5. Immediately upon the execution of a cooperative agreement, the Secretary will notify the Secretary of the Treasury of the amount to be expended by the United States within or adjacent to any National Forest thereunder, and upon the completion of each project, and the closing of the project accounts relating thereto, the Secretary will submit to the Secretary of the Treasury a statement of the total expenditures of Federal funds made on account thereof, and the distribution of such expenditures to each National Forest concerned.

Filling Joints in a Granite Block Pavement on a Road in Bergen County, New Jersey

By HENRY WELLES DURHAM*

Palisade Avenue, extending from the end of the road recently completed from the western terminus of the ferry from Dyckman Street, New York, to the top of the Palisades westward through Englewood, forms one of the principal routes connecting New York with the road system of New Jersey. Until recently, however, it has been in a very poor condition, rendering through travel difficult.

A paved roadway, 20 ft. in width, has just been completed by Bergen County for a length of one and one-half miles; forming the final connecting link in this highway.

A cross section of the Palisades at this point as elsewhere, shows a very abrupt rise from the river with a more gradual slope to the west, but the latter is sufficiently steep to necessitate grades on any east and west roadway, such as is Palisade Avenue, heavier than would be desired in designing a main thoroughfare. For the one-half mile of nearly level surface on the top of the hill, at an elevation of about 350 ft., the road has been surfaced with bituminous concrete. Hillside brick has been used for the remainder of the route and on grades up to a maximum of 8 per cent., except for a distance of about 1,000 ft at the western end of the improvement in Englewood, where the grade is a little over 10 per cent. and the traffic heavier on account of denser settlement. Here granite block was adopted, as it would have been for all the heavy grades, except for the economy effected by the use of brick.

The specification and contract for this work, prepared by a preceding administration, were not, in all respects, satisfactory, containing clauses vague in some respects and unnecessarily strict in others. An agreement was reached with the contractor, whereby work was executed in conformity with the standard specifications of the American Society of Municipal Improvements. All the work was rigidly inspected, materials being tested previous to acceptance, and results have been obtained in accordance with best standard practice. All wearing surfaces are laid on a 6-in. concrete foundation and protected by longitudinal concrete headers on either side.

The principal point of originality about the work has been in the method of filling joints in the granite block section.

During his term as Chief Engineer of Highways of the Borough of Manhattan, the writer introduced, for the granite pavements in New York City, a method of filling based on that employed successfully for many years in the city of Liverpool, England. There, sand is mixed with the tar in approximately equal proportions immediately previous to pouring the joints and the mixture stirred to a uniform consistency and then the joints carefully poured from pails provided with spouts. It was found in New York that, on account of the inability to secure the fine grade of sand available in Liverpool, it was a practical impossibility to mix more than one-third part of sand with the tar filler employed. Experience also showed it to be impracticable, under New York conditions, to fill the joints fully with one pouring, and it was inadvertently necessary to repeat this two or three times.

At first, the New York specifications provided that the joints be filled with sand to within 3 ins. of the surface previous to pouring, the theory being that the tar filler would penetrate the sand for some distance. In practice, it was found that there was no such penetration and it was also found impossible to prevent the filling of the joints with sand up to within an inch or two of the surface even with the most careful inspection. The specifications in New York were therefore subsequently modified by the omission of any sand in the joints and the substitution of a small amount of grit. But there still remained the difficulty of satisfactorily mixing in a small pail any considerable proportion of sand with the tar, and the waste of filler due to the several repourings and the inevitable spilling of material over the surface of the blocks each time. On Palisade Avenue, this method was discarded entirely and the tar and sand mixed and carried to the point of application in ordinary contractors' metal wheelbarrows. By securing a uniform quality of fine sand, thoroughly heating it before use, and mixing it in the barrel with the tar, as it was run from the kettle at a temperature of 290°, it was possible, by vigorous stirring with a hoe, to incorporate the sand in equal volume with the tar. The mixture was immediately wheeled to the point of application and dumped on the surface of the blocks, where workmen with squeegees immediately brushed it thoroughly into the joints. By requiring the men to work rapidly, it was possible not only to fill the joints from top to bottom with the mixture (there having been previously placed in them, on account of the adoption of the ½-in. width, a small proportion of grit) but, by care in the vigorous use of the squeegee, it was found that the amount of tar, which necessarily completely covered the surface, was not as thick nor as great in volume as that smeared over the surface of the blocks by two or three successive repourings. Investigation of completed work showed that in every case a thorough penetration of the filler had been effected down to the bottom of the block, and the large proportion of the sand had insured a consistency of the filler to avoid any running from the joints while leaving it with all required elasticity to furnish a foothold for horses. In order to avoid leaving the pavement with a sticky surface, a thin layer of sand was spread over it immediately after pouring. The completed work shows the efficacy of this method of joint filling.

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*County Engineer of Bergen County, New Jersey.

Although the blocks were not up to the best standard called for by Manhattan paving specifications, by a careful and rigid inspection it was found possible to produce a completed pavement that will compare very favorably with the class of work now being done on the other side of the river, and the filling of the joints is superior to any results heretofore obtained in New York with a bituminous filler.

part sand to one part paving cement by volume, or as much sand up to that proportion as the paving cement will carry. The sand shall be clean and sharp, and it shall pass a 10-mesh screen. It shall be thoroughly mixed with the paving cement by stirring or otherwise. The mixture shall be poured or squeegeed into the joints until they are full and remain full, so that they shall remain permanently filled flush with the pavement.

The coal tar paving cement shall be a straight run residue obtained by the distillation of coal tar, and shall comply with the following requirements:

A.—Melting point shall be not lower than 140° F. nor higher than 150° F.

B.—Free carbon shall not be less than 20 per cent. nor more than 35 per cent.

C.—Specific gravity at 77° F. shall not be less than 1.22 nor more than 1.30.

D.—Specific gravity of the distillate to 670° F. shall not be less than 1.06 at 140° F., compared with water at the same temperature.

VIEWS SHOWING THE MIXING AND APPLICATION OF PITCH AND SAND FILLER ON A GRANITE BLOCK PAVEMENT —PALISADE AVENUE, BERGEN COUNTY, NEW JERSEY.

The blocks were supplied under the following requirements as to dimensions.

The blocks shall be approximately rectangular on top and sides, and uniform in thickness. They shall be so cut that the joints between individual blocks when laid shall not exceed ½ in. The head of the block shall have no depression greater than ¼ in. from a straight edge laid in any direction, and parallel to the general surface of the block.

The size of the block shall be not less than 6 ins. nor more than 11 ins. long; not less than 3½ ins. nor more than 4½ ins. wide and not less than 4¾ ins. nor more than 5¼ ins. deep.

The filler complied with the following specifications.

The joint filler used shall be a mixture of paving cement described hereafter, and hot, dry sand in the proportion of one

There were required 1.7 gals. of bituminous material per square yard.

The approximate cost, including both labor and material, was:

	Per sq. yd.
Pitch	$0.143
Hauling Pitch	.020
Grit, 12 yards	.011
Sand, 20 yards	.019
Labor	.038
	$0.231

The contract was executed by E. C. Humphrey, for the Board of Chosen Freeholders of Bergen County.

The work was carried out under the supervision of the County Engineer.

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Number 15

The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

OCTOBER 7, 1916

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THE STATE AID PLAN

In the period of nearly a quarter century since the principle of state aid was first applied to the improvement of the public roads its efficiency has been amply demonstrated. This assertion needs on proof; indeed, its very general acceptance as an established fact is indicated by the adoption of some form of state aid in about eighty-five per cent. of the states in the Union.

While most of the states have accepted the principle, there has been great diversity in the details of its application. State aid in road work is of two kinds—engineering and financial.

The former, although the equivalent of financial assistance up to the value of the services rendered, can be properly considered separately. As it has been worked out it usually comprises the maintenance by the state of an engineering corps more or less at the command of the counties, towns or other units. The engineers may be members of the staff of a state highway department established for that purpose or they may be connected with some other public works department of the state government or with a state educational institution.

Financial aid, when extended, is generally in the form of money appropriated from the state treasury, in proportion to the amounts of local revenues appropriated for road work. As a rule, all or part of the funds received from automobile licenses are used for this purpose, often with other money taken from the general funds of the state or from special levies for highway work.

In addition to these two forms of state aid—which are the principal ones—there is that of using state convicts on local work. This plan is followed in a sufficient number of instances to warrant its being given passing note.

Engineering assistance is by far the most common form of state aid in road work—in fact, is usually the first step in a state's participation in the road affairs of its subdivisions. Many of the states now classed as state aid states give no other assistance. Financial aid, though not so generally given, is extended in a majority of the state aid states, the amount, as compared with the total expenditure, varying greatly.

With the rendering of assistance to counties, towns, road districts and other units, there is naturally assumed by the central authority a certain amount of control over the work performed wholly or partly with its funds. The extent of this state control varies greatly. In some instances it is complete with respect to certain specified highways or classes of highways and only partial in respect to others. In other cases none of the work is entirely under the control of the commonwealth. As might be expected, there is evident a relation between the proportional amount of money aid extended and the degree of control exercised; the more the state pays the greater, as a rule, is its supervisory power.

Briefly, no two working plans of state aid are alike; the several states that have adopted the principle have adapted it to their individual needs, resources and political conditions in both the manner and the degree of its application. This situation—notwithstanding the arguments sometimes advanced for uniformity—is probably as it should be. Road work—and by road work is meant not only the laying out and building of roads, but also the administering and financing of highway improvement and even the formulation of laws governing such work—is essentially engineering work. Being an engineering problem, the ways and means of adapting the state aid plan to the conditions found in a given state requires consideration as an individual problem just as the improvement of a given highway should be approached as a problem demanding the application of certain fundamental principles with due regard to the limitations imposed by local conditions.

THE VALUE OF FAILURE

If road builders would take to heart the opening paragraph of the paper presented by Prof. Benson at the recent meeting of county commissioners and engineers at Tacoma, Wash., and would put into practice the precepts that could be formulated from it, a decided advance in the art of building and maintaining roads and pavements would undoubtedly be the result.

The paper referred to dealt with the application of experimental research to the study of road building materials. Its opening paragraph, with another extract from the paper, is printed elsewhere in this issue of "Good Roads." The point needing especial emphasis is the scientific value of records of unsuccessful experiments—failures, as they might sometimes be called.

Every road builder, be he official, engineer or contractor, like every other man of intelligence and discernment, acquires much of his knowledge from his mistakes—or unsuccessful experiments. Like every man except the one who does nothing at all, he makes a lot of them. But as a rule these mistakes are little talked about; they do not serve as subjects of reports and technical papers, and the facts concerning them are seldom made available for publication. For this reason the engineer is limited in his opportunities to learn from the mistakes or unsuccessful experiments of other engineers. He is restricted practically to his own, and life is not sufficiently long for a man to make enough mistakes to teach him all he needs to know.

The remedy is obvious. Experiment after experiment is being conducted with road making methods and materials. The results of the successful experiments frequently are given wide publicity; not so with the results of the so-called unsuccessful ones. About the only recitals of failures are those in which the animus is so obviously to discredit something or other, regardless of its merit, as to nullify any value that might attach to the records.

Of course, it may be argued that the records of unsuccessful experiments would not show how to build roads, but how not to build them. In other words, there might be invoked against such records the stock arguments against destructive criticism as distinguished from constructive criticism. But destructive criticism has its uses and so have records of failures in experimental research. The former often does away with that which is bad and the latter prevents the waste of time and money in trying out methods and materials that are not suited to the work in hand. And in the ordinary experiences of life by no means the least profitable mistakes are those which show the things to be avoided.

WHY THE "LOWEST RESPONSIBLE BIDDER?"

If all the road failures could be very thoroughly investigated and the underlying causes ascertained with absolute certainty, it would probably be found that more than a few are due to the award of the contract to the "lowest responsible bidder."

In theory, awarding a contract in this manner may be open to no serious objection. Those intrusted with the oversight of public work should, of course, endeavor to get the most possible for every dollar of the public's money they expend. Hence it is logical to accept the lowest bid, provided only that the bidder is "responsible," assuming—as seems to be the custom—that whoever does the work will do it under specifications drawn by the party of the first part, and that a satisfactory job will be secured by adherence to these specifications, enforced, if need be, by adequate supervision through inspectors, resident engineers and others in the employ of the state, county, or city, or whatever governmental unit is having the work done.

Actually, however, the thing does not work out that way. "Responsible" is too indefinite, susceptible of too many interpretations. Usually it is so construed that a bidder with equipment and experience that are really inadequate can get a contract if he bids low enough to underbid the rest, but not low enough to appear ridiculous. Fortunately for the country's road building, the great majority of contractors are both able and honest. If this were not so the number of poor roads that ought to be good ones would be greater than it is, for a contractor who does not know his business or—more especially—one who has the desire and ability to "skin" the contract will do poor work in spite of the plans and specifications and the inspection—unless the latter is more thorough than it usually is on road work.

Always—or until human nature has undergone changes that can be looked for only with the coming of the millennium—there will be a few dishonest contractors and a considerable number of others who, because of lack of knowledge, executive ability or mechanical equipment, can not do good work. Moreover, there will always be a certain small proportion of engineers and inspectors who are incompetent or dishonest, or both. But in the meantime roads must be built, many of them by contract, and the taxpayers must be given the maximum value for their money.

How can this be brought about?

No attempt is to be made to answer here. The problem has been before engineers and public officials for a long time, and the records do not show that a satisfactory solution has been found. Is the elimination of undesirable bidders to be effected by licensing contractors, by preparing lists of contractors of known ability, resources and responsibility and then inviting bids from them, or by some other means? The matter is of very great moment to every reader of "Good Roads"—public official, engineer, contractor or taxpayer. Expressions of opinion or recitals of experiences with methods that have been tried out and proven successful or unsuccessful will be welcomed.

NEWS NOTES

The Making of "Bumps" in the Pavement at a railroad grade crossing is being tried in Los Angeles, Cal., as a means of reducing the speed of automobiles crossing the tracks and thus the number of accidents. The work is being done at the intersection of Mission Road, a main thoroughfare between Los Angeles and Pasadena, and the four tracks of the Pacific Electric Railway. The "bumps" or checks are built for a distance of 50 feet on either side of the tracks.

The Use of Prisoners Serving Terms for Misdemeanors on Road Work in Kansas is being advocated by Governor Capper of that state, and in pursuance of this policy the Governor has sent letters to the mayors of the larger cities, and the sheriffs of the larger counties in the state, asking their opinion as to the advisability of seeking legislation making possible the use of such convicts. It is stated that the replies received indicate such widespread interest in his undertaking that Governor Capper is confident that the necessary laws can be secured at the next session of the legislature.

The Proper Thickness for Expansion Joints in Brick Pavements is treated at some length in "Brick Roads," a professional paper by Vernon M. Peirce, Chief of Construction, and Charles H. Moorefield, Senior Highway Engineer, of the Office of Public Roads, which has recently been printed as Bulletin No. 373 of the United States Department of Agriculture. According to the authors, much difference in opinion exists among engineers as to the proper width of the joints, some advocating a minimum thickness of 1 in., while others prefer a minimum as low as ⅜ in. for very narrow pavements. It is generally agreed, it is stated, that the width should vary with the width of the pavement, and Messrs. Peirce and Moorefield suggest the following standard: For roadways 20 ft. or less in width, joints ½ in. wide; roadways from 20 to 30 ft. in width, joints ¾ in. wide; roadways from 30 to 40 ft. in width, joints 1 in. wide; roadways over 40 ft. in width, joints 1¼ ins. wide.

The Yolo Basin Concrete Trestle

A photograph of the concrete trestle built by the California Highway Commission over the Yolo By-pass of the Sacramento River is reproduced herewith. This trestle, which according to reports is the longest structure of its kind in the world, carries the road leading from Sacramento across the Sacramento Valley to the west. The Yolo By-pass which made necessary the construction of the bridge is a broad channel provided for carrying the waters of the Sacramento River down the Sacramento Valley in the spring when the river is swollen by melting snow from the mountains. As these floods often last for some weeks the road across the by-pass had to be built above flood level and in such a manner as to offer the minimum obstruction to the flow of water down the channel. A concrete trestle was decided upon as the proper structure and a contract was awarded for the work in July, 1914.

The entire trestle is 16,310 ft. in length. The western 2,000 ft. is of timber construction while the remainder is of concrete except for a short bascule span over a navigation channel at the eastern end. The timber trestle crosses an area which is expected to be cut off from the by-pass at some future time by the construction of a levee. When this is done the trestle will be replaced by an earth fill.

CONCRETE TRESTLE OVER THE YOLO BY-PASS IN THE SACRAMENTO VALLEY, CALIFORNIA.

The roadway over the trestle is 21 ft. in width between the railings. The bents are placed 20 ft. apart, and rise to a height of from 16 to 20 ft. above the level of the ground. Each bent consists of four reinforced concrete piles, the two inside piles being vertical and the two outside piles being inclined toward the center on a batter of 1 to 8. The piles are of different lengths, from 32 to 50 ft., to provide for the difference in the level of the ground. They are 14 ins. square, tapering for 5 ft. at the lower end to a section 6 ins. square. They weigh from 3 to 5½ tons each. The piles in each bent are surmounted by reinforced concrete caps upon which rest the floor slabs. There are five of these slabs laid side by side between each two bents. The slabs weigh about 6 tons apiece, and are built like inverted boxes with side and end walls 18 ins. high and tops 5 ins. in thickness. Concrete parapets 15 ins. high surmounted by galvanized pipe railings are erected at each side.

The concrete piles were cast at a yard at the west end of the trestle and were carried to the work by a narrow gauge railway carried on temporary stringers and cross ties laid on top of the bents already completed. When the ground was dry, the pile driver was carried ahead of the work on skids laid directly on the ground. When the ground was wet and spongy it was carried on a temporary wooden trestle erected ahead of the concrete trestle.

The first concrete pile was driven in January, 1915, and the last in October of that year. The structure was opened to the public on March 18 of this year. The cost of the concrete materials and the reinforcing steel was about $148,000. These materials were supplied by the State Highway Commission which has a special half-rate freight schedule with the California railroads. The price paid to the contractors, the Graff Construction Co. of Seattle, was about $246,000, making the total cost of the trestle approximately $400,000.

The Esthetics of Highway Bridge Design*

By ALMON H. FULLER†

While the economics of a proposition should never be lost sight of, other factors usually must be considered and frequently govern. The demands of traffic must be satisfied even at a financial loss, and the appearance of a structure should ever be kept in mind. Good taste does not necessarily cost money. Much can be done in replacing an ugly design and careless construction by a pleasing production well put together, without an appreciable increase in cost. Natural good taste that does not involve the taxpayers' money should always be demanded. In addition to this the enhanced appearance sometimes amply justifies additional expenditure.

As individuals, we spend more money on our clothes and our homes than bare necessities would demand. Why? Perhaps the "keeping up with Lizzie" spirit is responsible for a considerable proportion, yet much of it comes from the honest belief that it is worth while; that there is a refining influence behind it and that it gives a wholesome enjoyment which makes better citizens.

The same idea prevails to a certain degree in our public buildings, parks and playgrounds; and, it is refreshing to note, sometimes also in public roads and the highway bridges that are a part of them.

Who can look at the beautiful concrete bridge across Hangman's Creek in Spokane and compare it with the steel railway viaduct not half a mile away, without a feeling of civic pride on the one hand and a sense of disappointment on the other? I have heard from reliable sources that an economic study suggested a steel viaduct and that the city is paying more each year in interest alone for the present construction than would cover the interest, maintenance and amortization for a steel one. The question is, "Is it worth the difference¿" This can not be answered from the result of cold calculations. The credit side of the ledger shows a deficit in dollars and cents. Reading between the lines brings out assets not considered in Wall Street or listed in Bradstreet. Who can look upon that picture without forgetting a grouch and getting an inspiration for higher thinking and nobler doing? Who dares overlook the effect of that rare combination of natural and man-made beauty upon the ideals and aspirations of coming generations and attempt to measure it in cold coin?

This illustration could be multiplied by hundreds. Lest we get the erroneous opinion that only concrete bridges may be made effective in appearance, let us focus our attention for a moment upon the magnificent Hell Gate Arch now nearing completion in New York City. Built under a franchise requiring the approval of an art commission, the engineer, Gustav Lindenthal, in consultation with a noted firm of architects, has evolved a structure that demonstrates the possibility of bringing steel truss work into dignified and pleasing lines and making it conform, architecturally, to the surroundings. This is not an isolated example, but space forbids further illustration.

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*Extract from a paper presented at the annual meeting of the Washington State Association of County Commissioners, Tacoma, Washington, September 14-16, 1916.

†Dean, College of Engineering, University of Washington, Seattle, Wash.

COMING MEETINGS

October 9-13—American Society of Municipal Improvements.—Twenty-third Annual Convention, Newark, N. J. Secretary, Chas. C. Brown, 702 Wulsin Bldg., Indianapolis, Ind.

October 10-15—League of California Municipalities.—Annual meeting, Visalia, Cal. Secretary, H. A. Mason, Pacific Building, San Francisco, Cal.

October 11-13—League of Kansas Municipalities—Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

October 13-14—Society for Street Cleaning and Refuse Disposal.—Annual meeting, New York, N. Y. Secretary, Joseph R. Buchanan, Municipal Building, New York, N. Y.

October 18-19—League of Minnesota Municipalities.—Annual meeting, Red Wing, Minn. Secretary, Richard R. Price, University of Minnesota, Minneapolis, Minn.

October 26-28—League of Texas Municipalities.—Fourth annual convention, Hillsboro, Tex. Secretary-Treasurer, Prof. H. G. James, Austin, Tex.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary Robert F. Hall, 210 South La Salle Street, Chicago, Ill.

American Society of Municipal Improvements

The opening session of the twenty-third annual convention of the American Society of Municipal Improvements at Newark, N. J., October 10-13, 1916, will be held at the Robert Treat Hotel at 10:30 a. m., Tuesday, October 10. The session will be devoted largely to reports of officers and committees, among the latter being the Special Committee on Standard Tests for Bituminous Materials. The work of the convention will commence on Monday, October 9, when the various sub-committees on standard specifications will meet at different hours from 11:00 a. m. to 3:30 p. m.

Technical sessions will be held Tuesday morning and evening, Wednesday morning and afternoon, Thursday morning and evening and Friday morning. Among the papers and committee reports on street and road work and kindred subjects are the following:

Tuesday evening: Report of Committee on Street and Sidewalk Design, Chairman, E. A. Kingsley, Consulting Engineer, San Antonio, Texas.

Wednesday morning: Report of Committee on Refuse Disposal and Street Cleaning, Chairman, E. R. Conant, Chief Engineer, Savannah, Ga.; "Street Cleaning of Savannah, Ga., Method Employed, Cost Data, etc.," by E. R. Conant; "Problems and Methods in Snow Removal and Disposal," by H. S. Richards, Superintendent of Maintenance and Repair, South Park Commissioners, Chicago, Ill.; "Flushing; Its Place in the Street Cleaning Field," by Raymond W. Parlin, Bureau of Municipal Research, New York, N. Y.; Report of Committee on Traffic and Transportation on a Proposed Standard Form of Making Traffic Counts, Chairman, J. C. Hallock, Engineer in Charge of Port Newark Terminal, Newark, N. J.; "Necessity for Limiting the Loads, Speed and Size of Vehicles," by E. W. Stern, Chief Engineer of Highways, Borough of Manhattan, New York, N. Y.

Thursday morning: Report of Committee on Street Paving on Present Practice Regarding Replacement of Cuts in Pavement, Chairman, Horace Andrews, Consulting Engineer, Albany, N. Y.; "The Passing and Conservation of Macadam City Streets and Country Roads," by George C. Warren, President, Warren Brothers Co., Boston, Mass.; "Business System Applied to Street and Road Management," by Will P. Blair, Secretary, National Paving Brick Manufacturers Association, Cleveland, Ohio; "The Resurfacing of Old Brick Pavements with Sheet Asphalt at Columbus, Ohio," by T. H. Brannan, Superintendent of Asphalt, Columbus, Ohio.

Thursday evening: "The Proper Oil for Treating Creosoted Wood Blocks for Paving," by P. C. Reilly, Indianapolis, Ind.; "Treatment of Wood Paving Blocks," by C. H. Teesdale, U. S. Forest Products Laboratory, Madison, Wis.; "Concrete Paving Experiences," by K. C. Gaynor, Consulting Engineer, Sioux City, Iowa; "Vertical Fiber Brick and Wood Block Pavements in the South," by E. A. Kingsley, Consulting Engineer, San Antonio, Texas; "Granite Paving," by C. D. Pollock, Consulting Engineer, New York, N. Y.; "Granite Pavements in the Borough of Manhattan," by R. A. MacGregor, Assistant Engineer, Bureau of Highways, Borough of Manhattan, New York, N. Y.; "The Repaving of Broad Street, Elizabeth, New Jersey, with Grouted Granite Block," by Thomas E. Collins, City Engineer, Elizabeth, N. J.; Report of Committee on Standard Specifications, Chairman, George W. Tillson, Consulting Engineer to the Borough President, Borough of Brooklyn, New York, N. Y. (Subcommittees: Asphalt Paving, Chairman, Francis P. Smith, New York, N. Y.; Bituminous Paving, Chairman, Linn White, Chicago, Ill.; Broken Stone and Gravel Roads, Chairman, A. H. Blanchard, New York, N. Y.; Brick Paving, Chairman, E. H. Christ, Grand Rapids, Mich.; Concrete Paving, Chairman, W. J. Hardee, New Orleans, La.; Stone Block Paving, Chairman, H. H. Schmidt, Brooklyn, N. Y.; Wood Block Paving, Chairman, E. R. Dutton, Minneapolis, Minn.; Sewers, Chairman, E. J. Fort, Brooklyn, N. Y.) "Attention to Detail, a Weak Point in American Municipal Work," by Henry Welles Durham, County Engineer of Bergen County, N. J., Hackensack, N. J.; Report of Committee on Standard Forms, Chairman, A. Prescott Folwell, New York, N. Y.

Friday morning: Report of Committee on Street Lighting, Chairman, F. G. Lynch, City Engineer, Erie, Pa.; "Recent Developments in Street Lighting Theory and Practice," by Preston S. Millar, General Manager, Electrical Testing Laboratories, New York, N. Y.; "Pasadena's Electric Utility and Street Lighting System," by C. Wellington Koiner, General Manager, Municipal Lighting Department, Pasadena, Cal.; "New Street Lighting System Being Installed in Milwaukee, Wis.," by Arthur J. Sweet, Milwaukee, Wis.

On Tuesday afternoon members, guests and ladies attending the convention will be given an automobile ride through the city and through the county park system to Eagle Rock and Cedar Grove Reservoir, inspecting county institutions along the route. On Wednesday evening a banquet will be tendered by the City of Newark at the Robert Treat Hotel and on the same evening there will be a theater party for ladies. On Thursday forenoon there will be an inspection of the Port Newark Terminal and the Municipal Dock, and a trip around New York Harbor by boat. A special train on the Jersey Central Railroad will leave the Broad Street Station, Elizabeth, at 10:30. Luncheon will be served on the boat during the harbor trip. Special trips will be arranged for those who desire to take them to various points of local interest, these including the Edison Laboratories at West Orange, the American Creosoting Plant, the breweries, the Western Electric Instrument Plant and the Patent Leather Plant, all at Newark, the General Electric Lamp Works at Harrison, and the Passaic Valley sewer construction.

The election of officers and the selection of the next place of meeting will be held at the beginning of the Wednesday morning session.

REPORT

BRITISH ROAD BOARD. Sixth Annual Report for the year ending March 31, 1916. Paper, 8¼x13 ins., 56 pp. and covers.

This report consists of a brief resume of the work of the Road Board during the fiscal year, and fifteen appendices showing details of the work. Included in the appendices are tables showing maintenance expenditures of various highway authorities in England and Wales, tables showing the expenditures on roads in the United Kingdom during 1914, and a report on road material tests at the Road Board laboratory.

NEW PUBLICATIONS

PUBLIC ROAD MILEAGE AND REVENUES IN THE MIDDLE ATLANTIC STATES, 1914. Bulletin No. 386, U. S. Department of Agriculture. Contribution from the Office of Public Roads and Rural Engineering; issued September 11, 1916. Paper, 6x9 ins., 28 pp.

This bulletin is described in the subtitle as "a compilation showing mileage of improved and unimproved roads; sources and amounts of road revenues; bonds issued and outstanding; and a description of the road administration and fiscal management, and of other factors affecting road improvement in each state." The first part of the bulletin is devoted to general matter dealing with the methods of collecting statistics and briefly with road administration in the middle Atlantic states, public road revenues, road mileage in 1914, and the development of new types of highway. The latter part of the bulletin comprises detailed information on road work in the states of New Jersey, New York and Pennsylvania, presented in short statements and by tables.

"BRICK ROADS," by Vernon M. Peirce, Chief of Construction, and Charles H. Moorefield, Senior Highway Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Professional Paper, Bulletin No. 373, Department of Agriculture, dated August 25, 1916. Paper, 6x9 ins., 40 pp. and covers; illustrated.

The text of this bulletin comprises a short but comprehensive description of brick pavements and of the methods employed in their construction, including sections on the raw materials for the manufacture of brick and the processes of manufacturing. In the appendices are typical specifications for the construction of brick roads and the methods of inspecting and testing paving brick recommended by the sub-committee on paving brick of the American Society for Testing Materials. The illustrations consist of perspective drawings showing the methods of laying brick pavements with stone and concrete curbs, sectional drawings of brick pavements, a working drawing showing the construction of a grout box and another drawing showing the construction of a brick rattler, and several half-tone reproductions of photographs showing properly and improperly constructed brick pavements and the various steps in the laying of brick pavements.

RULES AND REGULATIONS OF THE SECRETARY OF AGRICULTURE FOR CARRYING OUT THE FEDERAL AID ROAD ACT. Circular No. 65, United States Department of Agriculture, issued September 1, 1916. Paper, 6x9 ins., 24 pp. and covers.

Included in this publication are two sets of rules and regulations for the administration of the federal aid road act passed at the last session of Congress, and the text of the act. The first set of rules and regulations applies to all of the act except section 8. The second set applies only to section 8 which deals with the improvement of roads in the national forests.

PERSONAL NOTES

R. P. Boyd, formerly Assistant State Highway Engineer of Alabama, has resigned and is now associated with J. W. Billingsley, a consulting engineer of New Orleans, La.

J. B. Converse, Selma, Ala., has been appointed Assistant State Highway Engineer of Alabama, succeeding R. P. Boyd, whose resignation is noted elsewhere in this column.

C. B. McCullough has resigned as Assistant Chief Engineer of the Iowa State Highway Commission. He is to have charge of the structural engineering course at the Oregon State Agricultural College at Corvallis, Ore.

Robert C. Clifford, who has been District Sales Manager for the United States Cast Iron Pipe & Foundry Co., with offices in St. Louis and Kansas City, Mo., has been placed in charge of the rail department of the Walter A. Zelnicker Supply Co., St. Louis, Mo.

John V. Sprague has resigned from the engineering staff of the New York, New Haven & Hartford Railroad and joined with Thomas F. Maher, a paving and sewer contractor of New Haven, Conn., in the formation of a new contracting company in that city.

NEWS NOTES

Various Types of Street Lamps in Lexington, Ky., are to be erected as an experiment. These installations are to be operated for several weeks in order to determine the most satisfactory. The work will be done by the Lexington Utilities Co., which has recently acquired a 20-year electric lighting and power franchise.

A Scenic Highway Across the Continental Divide was opened through Wolf Creek Pass, Colorado, in August. The road is a 30-mile connecting link in a 600-mile state highway across the state. The portion of the road on the eastern side of the divide is about 16 miles long, and that on the western side about 14. Grades were kept down to 6½ per cent. except in a few cases where that had to be exceeded. The topography governed the alignment of most of the road and there are many deep cuts, heavy fills, sharp curves, and bridges. As a rule the road is 14 ft. wide, including the ditch although on some sections where the grading was unusually heavy, it was built only 10 ft. wide. The roadbed is flat and slopes toward the bank side where there is a drainage ditch. Log culverts are used throughout the length of the road, and the bridges are also of logs. These bridges are queen post structures, 20 ft. wide, and of spans up to 40 ft. A little more than half the road is surfaced with rock obtained on the ground. The remainder is to be surfaced later with disintegrated granite. The road was paid for by the state, the work being done under the supervision of a joint board representing the counties interested. All plans were approved by the State Highway Commission. The average cost to the state was about $3,000 per mile.

LETTER TO THE EDITOR

A Convict Road Camp in the Adirondacks

Editor "GOOD ROADS":

In your issue of August 12, on the first page, you have a couple of paragraphs—"New York Convicts to Build Adirondack Roads."

It may be of interest to you to learn that this camp consists of 30 laborers, a cook and 2 official guards; they are not only doing excellent work, but so far as the writer can see from two personal inspections, the morale of the camp is excellent and the men are looking better every day. The work upon which they are engaged is that of making passable about 7 miles of road through two short pieces of timber on either side of Shurtliff's Hotel on the most direct route from Watertown to the Tupper Lake region. The first ten days these men were on this stretch of road they cleared the brush on either side of the wheel tracks, filled up the worst ruts and holes and drained the water pockets, thus putting the road in better shape for travel than it has been in a number of years. They are now going over the work more in detail, grading and draining and following up with gravel, there being at present eight teams engaged in the latter operation.

The camp consists of four old railroad cars, which have been made water-tight with building paper, etc., furnished by the Grasse River Railroad. One of the great advantages of this camp is that this railroad, which is owned by the Emporium Lumber Products Co., has switches so located that these cars can be placed at two different points on the work, thereby requiring a minimum amount of lost time between the camp and the place of labor.

There is much interest taken in this work by the villages and hotels scattered along the route, and also those not on the route but which may be affected thereby, and it is hoped that these men can be left upon this work as long as the weather will permit.

T. M. RIPLEY,
Division Engineer,
New York State Commission of Highways.
Watertown, N. Y.

BOOK NOTICE

THE CONSTRUCTION OF ROADS AND PAVEMENTS, by T. R. Agg, C. E., Professor of Highway Engineering, Iowa State College. Cloth, 8vo., 432 pp.; illustrated. McGraw-Hill Book Co., 239 West 39th St., New York, N. Y. $3.00.

This book, according to the preface, was intended primarily for use as a text book and also "to meet the demand for a concise presentation of approved practice in the construction of roads and pavement, and of the principles involved." It contains, besides the preface, a glossary of terms, and an index, twenty chapters on road and pavement construction. The chapter headings of these are as follows: I—The Development of Highway Systems; II—Surveys and Plans for Roads and Pavement; III—The Design of Rural Highways; IV—The Construction and Maintenance of Earth Roads; V—Testing Non-bituminous Road Materials; VI—Sand-Clay Roads; VII—Gravel Roads; VIII—Water Bound Macadam Roads and Pavements; IX—Concrete Roads and Pavements; X—Vitrified Brick Roads and Pavements; XI—Wood-block Pavements; XII—Stone-block Pavements; XIII—Bituminous Road and Pavement Materials; XIV—Dust Layers and Bituminous Carpets; XV—Penetration and Mixed Macadam Roads and Pavements; XVI—Sheet Asphalt and Asphaltic Concrete Surfaces; XVII—Selection of Type of Surface for Rural Highways; XVIII—Selection of Type of Pavement Surface; XIX—The Design of Pavements; XX—Tests for Bituminous Road and Paving Materials. The book is profusely illustrated by plans and drawings and by reproductions of photographs of improved roads, road surfaces of various kinds, roads and pavements under construction, and machinery and equipment used in highway work. There are also included many valuable tables, extracts from specifications, and outlines of testing methods. The glossary, to which reference has been made, contains a list of various terms used in highway work which have been defined by committees of the American Society of Civil Engineers and the American Society for Testing Materials. The book is well arranged and treats the subject briefly but comprehensively.

THE AMERICAN ROAD by James I. Tucker, Professor of Civil Engineering, University of Oklahoma, and Consulting State Engineer of Oklahoma. Cloth, 5x7½ in., 228 pp.; illustrated. The American Road, Extension Division, University of Oklahoma, Norman, Okla. $1.00.

This book comprises the text of the several pamphlets making up the correspondence course in road building, given by the Extension Division of the University of Oklahoma, and noted in "Good Roads" for April 1, 1916. The book is described by its subtitle as "a non-engineering manual for practical road builders." Its scope is indicated by the chapter headings: General Conditions and Preliminary Studies, Road Economics, Road Administration, Convicts and Road Work, Earth Road Construction, Cost Accounting and Earth Work, Earth Road Maintenance, Waterways, Bridges, Road Finance, Stone Roads, Gravel Roads, Sand-Clay Roads, Road Building with Oils, Needed Legislation. It is profusely illustrated by halftones, showing roads before and after improvement, and bridges, and also a number of drawings and diagrams.

NEWS NOTES

Paved Roads Radiating from Cleveland, Ohio, to every dairying section serving the city were found to be among the municipality's assets upon making a survey of the food resources a few weeks ago, when a serious railroad strike seemed imminent. According to a report, the system of brick paved roads centering at Cleveland has resulted in so extensive market gardening in the vicinity that the city is actually an exporting point for vegetables rather than an importing point.

River Sand for the Concrete Work in some of the California state highway construction is obtained from a plant on the Salinas River near San Luis Obispo operated by the California Highway Commission. Each year the floods bring down enough sand and gravel to fill the excavations made, so that the supply would seem practically inexhaustible. The material is taken from the river bed by a ¾-yd. bucket operated from a steel cable stretched across the river. This cable is brought to the top of a mast near the plant and the material is dumped from the bucket into bins. It is then washed and screened and stored in bins from which it is delivered by gravity to cars on a spur track. It is stated that if the value of the sand is figured at its contract price, the plant will show a profit.

Unnecessary Street Widths Are Common in Sacramento, Cal. according to a recent report by John Nolen, of Boston, Mass., a well known authority on city planning. Over 50 per cent. of the area of the old city is occupied by streets and alleys, Mr. Nolen reports, whereas 30 per cent. would be a liberal allowance. "This means," he continues, "that at least 20 per cent. of the 3,000 acres of the old city, or about 600 acres of the most valuable land in Sacramento, is worse than wasted. These 600 acres would give the city many streets 100 ft. wide for transportation purposes, double the present number of plazas, provide three or four blocks for a liberal civic center and at least two blocks for each public school. Furthermore it would reduce the cost of street upkeep many thousand dollars a year, save time in transit for both people and goods and increase the income of the city from local taxes, because more property could be used productively."

EQUIPMENT — TRADE — MATERIALS

New Tractor and Trailer

A tractor and trailer especially for the contractor's use, in the construction of which there have been embodied several features designed to make the outfit especially adapted to that kind of work, has recently been put on the market.

The tractor has a Continental 4-cylinder, 4-cycle L-head motor of 4½-in. bore and 5½-in. stroke. The A. L. A. M. rating is 32.4 HP., and at 1,500 R. P. M. the motor will develop 47 HP. The ignition system includes a Bosch high tension magneto with dry batteries and a Bosch vibrating duplex coil for starting. The radiator is of the honeycomb type and is mounted on coil springs. The motor is controlled by a Pierce governor of the fly-ball type. The transmission is through a Brown-Lipe selective speed gear with four forward speeds and one reverse. The front axle is of the Timken I-beam section type with Timken roller bearings on wheel spindle and steering knuckle bolts. The rear axle is of the Timken worm gear, full-floating, construction with Timken bearings throughout, and a worm gear ratio of 10 1/3 to 1. The capacity of the machine is five tons.

A feature of the construction to which special attention is called is the use of a frame and subframe. The subframe carries the power plant, gasoline tank and driver's seat, and is supported by a set of springs considerably lighter than the springs supporting the main frame. The particular advantage of this construction is the material reduction of the vibration to which the power plant is subjected when the outfit is running empty.

Another feature of the machine is the short distance required for turning. The tractor and trailer can be turned around without backing in a 30-ft. circle, and, by backing once, in a 20-ft. circle.

The trailer is of the bottom dump type and is equipped with wooden steel-tired wheels. These wheels carry approximately 60 per cent. of the trailer load, thus bringing upon the rubber-tired driving wheels of the tractor only sufficient weight to insure traction. The trailer is dumped entirely by gravity and is easily detached from the tractor. This latter feature makes it possible to use a number of trailers on a job or to substitute trailers with different bodies for the various kinds of work in which the outfit may be used.

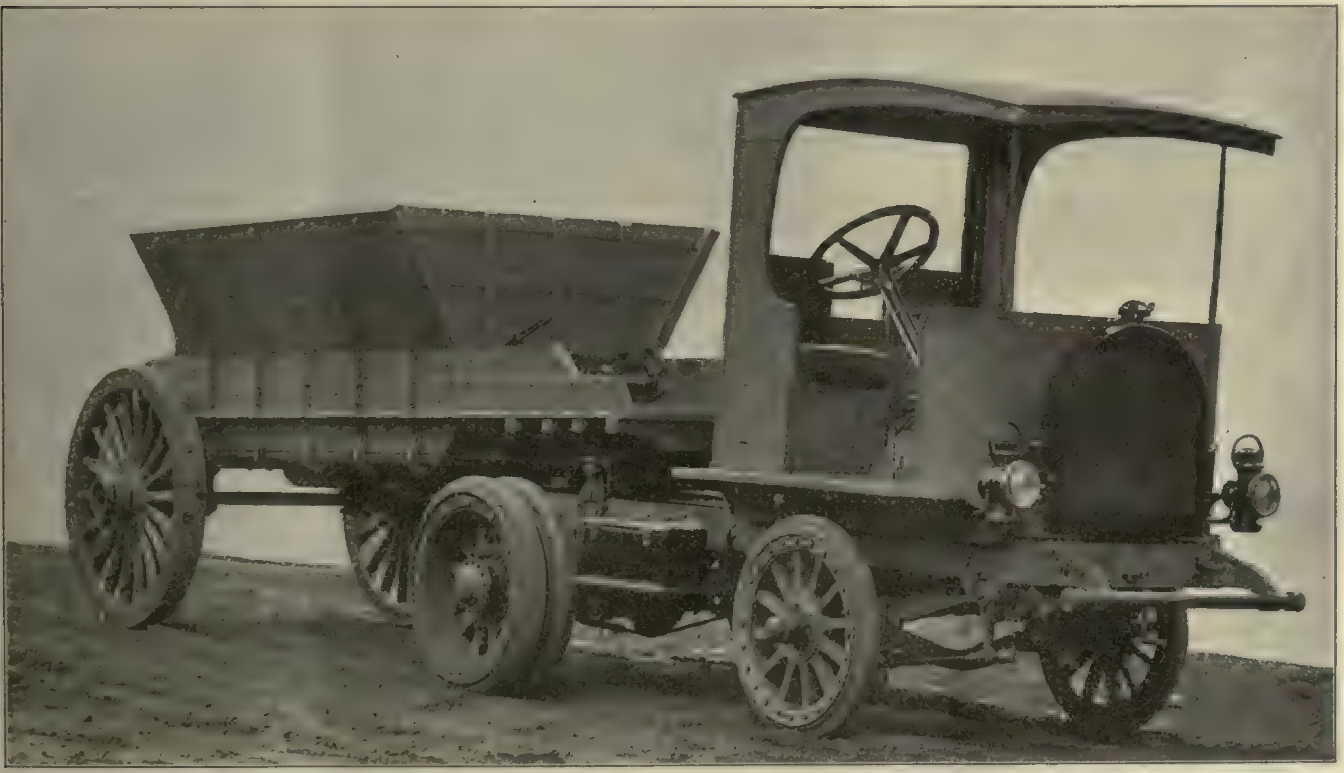
The tractor and trailer has been tried out under very severe conditions for over a year with uniformly good results. It is known as the "100 per cent. Watson" tractor and trailer, and is manufactured by the Watson Wagon Co., of Canastota, N. Y.

Booklet on Hydrated Lime in Concrete

A booklet dealing with the use of hydrated lime in concrete has recently been issued by the Hydrated Lime Bureau of the National Lime Manufacturers' Association, Pittsburgh, Pa.

The booklet, which is entitled "Dependable Concrete" carries the subtitle, "Hydrated Lime and Its Effect on Workability, Segregation, Uniformity, Strength, Permeability." The first section of the booklet deals with the requisites of dependable concrete and is followed by a list of the results to be achieved by adding small quantities of hydrated lime to concrete mixtures. These are given as follows:

"1. Increases the slipperiness of the concrete so that it flows freely without the use of excess water. 2. Minimizes the tendency of sand and stone to separate from the cement, preventing the formation of stone pockets and honeycombing. 3. Produces a freer moving concrete in the forms,



NEW TRACTOR AND TRAILER MADE BY THE WATSON WAGON CO.

making spading easier and resulting in more nearly perfect exterior surfaces and better embedment of reinforcing steel. 4. Results in homogeneous concrete of maximum strength. 5. Renders the concrete less porous and more nearly impermeable, minimizing alternate expansion and contraction due to moisture changes. 6. Acts as added protection against corrosion of reinforcing steel."

The remaining portions of the booklet discuss the plastic properties and maximum strength of concrete, watertight concrete, expansion and contraction, protection of reinforcing steel, and other matters. The booklet carries four illustrations. One is of a concrete dam on the White Salmon River in Washington; two of the others show parts of the St. Louis filtration plant, and the fourth shows a monolithic type concrete road in Kane County, Illinois, in the construction of which 10 per cent. of hydrated lime was used. The booklet is 6x9 ins. in size and consists of sixteen pages, including the covers.

Army Road Building with Jeffery "Quads"

An example of the usefulness of the motor truck in military road building is shown in the accompanying illustration of Jeffery "Quads" hauling a Russell grader on a road somewhere along the Mexican border.

Road building is one of the very important incidental operations of warfare and in it, as in all other military operations, the most improved machinery and equipment is required.

JEFFERY "QUADS" HAULING RUSSELL ROAD GRADER ON THE MEXICAN BORDER.

Since the dispatch of Gen. Pershing's expedition into Mexico the getting of supplies to the troops has necessitated very extensive road work, and scrapers and graders have been used in large numbers. Various means of hauling these machines have been used, among them the "Quads." For some of the heavier work with elevating graders, three of these powerful trucks have been required for each machine. It is common practice, it is stated, to set the grading knife even with the bottom of the wheels, thus frequently making a cut of 5 or 6 ins. through sticky earth.

The Jeffery "Quad" is manufactured by the Nash Motors Co., successor to the Thomas B. Jeffery Co., Kenosha, Wis.

Motor Trucks Used in the Construction of the New Cleveland High Level Bridge

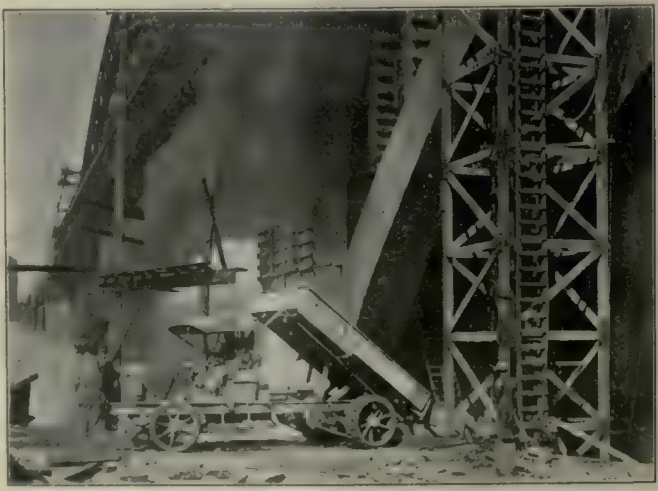
In the construction of the new high level bridge in Cleveland, Ohio, extensive use has been made of motor trucks for hauling material. Forty-four White trucks used by eight different contractors or building material companies, it is stated, have hauled over 60 per cent. of the material used in the structure.

The bridge consists of 12 concrete spans and 1 steel span and has a total length of 2,880 ft. The steel span over the Cuyahoga River is a 3-hinged steel arch 591 ft. in length and 200 ft. above the water. The bridge is 81 ft. 6 ins. wide, over all, and will carry a 45-ft. roadway, with sidewalks, on the upper deck, and six street car tracks on the lower deck. When completed it will connect the downtown district with the west side of the city. The work was commenced in May, 1912, and it is expected that the portion of the bridge for vehicular and pedestrian traffic will be opened some time next month.

GENERAL VIEW OF RIVER SPAN AND ADJOINING SPANS —CLEVELAND HIGH LEVEL BRIDGE.

The principal use of the White trucks has been the carrying of concrete materials to the mixers and the carrying of the mixed concrete from the mixers to the lifts at various parts of the structure. One of the accompanying illustrations shows the truck dumping a load of mixed concrete at one of the lifts, while the other illustration is a general view of the steel center span and one of the concrete arches adjoining.

It is stated that a considerable saving in time and money has been effected by the use of trucks in this work on account of the enormous amount of material which had to be hauled to the bridge. According to information furnished by the White Co., the materials hauled by the White trucks have comprised the following: 543,000 sacks of cement, 62,692 tons of sand, 15,653 tons of limestone, 108,900 cu. yds. of mixed concrete, several thousand cubic yards of slag, and a considerable amount of miscellaneous materials and supplies. The trucks have been used by the Hunkin Conkey Construction Co., R. W. Blake, Cleveland Builders Supply Co., Cleveland Macadam Co., Cuyahoga Builders Supply Co., and others.



WHITE TRUCK DUMPING LOAD AT LIFT, NEW CLEVELAND HIGH LEVEL BRIDGE.

New Gasoline Tractor

A new gasoline tractor for road and other work has recently been put on the market. The machine, which is known as the "American" tractor, is shown in the accompanying illustration.

The frame consists of two longitudinal heavy steel channels riveted to four cross members, and contains no bent sections. The power is furnished by a Wisconsin, heavy duty, T-head motor attached to the frame by four steel brackets. It is equipped with a Carter carburetor, automatic speed governor, a separate automatic speed control operated in unison with the clutch, and an independent high tension magneto, battery and distributor with two sets of spark plugs, thus providing two independent ignition systems. The motor is mounted just back of the forward axle, the relative positions of the motor, fly wheel and transmission being practically the same as in the ordinary automobile. The gasoline tank is mounted just in front of the cab, the feed being by gravity. Lubricating oil is pumped to all bearings and working parts, and the motor is water cooled, a centrifugal pump providing the circulation. The starting crank is operated by a 2:1 gear reduction for easy cranking.

NEW "AMERICAN" TRACTOR HAULING TRAILERS IN ROAD WORK.

All four wheels are drivers and the machine is steered by both the front and rear axles. Each wheel consists of two angle iron rims fastened together transversely by cleats set at an angle of 22 degrees with the horizontal. Each wheel is fitted with 30 spokes and 8 pull rods. The spokes are designed to carry the load and the pull rods to take care of the driving. The faces of the wheels between the cleats are open to prevent clogging with mud or snow.

The clutch is of the expansion type and is operated by means of a clutch lever of the usual type in the cab. The transmission is of the selective type with three speeds forward and one reverse. The gear shifting mechanism is entirely enclosed in an oil-tight transmission case. The brake drum is mounted just outside the transmission case on an extension of the secondary shaft. It is operated by the lever which operates the clutch, the arrangement of the links being such that releasing the clutch also applies the brake. The driving shaft is mounted on roller bearings carried on brackets bolted to the lower side of the frame. The front and rear axles are driven from the driving gear on this shaft through adjustable chains made of vanadium steel. Each link is adjustable for stretch and wear, and is self-locking. The axles are of the semi-floating type and are alike except in the method of attachment to the frame. The axle shafts are of nickel steel carried in four large roller bearings in each wheel. The rear axle is mounted on a large ball bearing attached to the frame, while the front axle is connected with the frame through a ball and socket joint.

The steering gear is of the worm and worm wheel type. The connection with the axles is through block chains and turnbuckles. The gearing is completely enclosed in a housing which carries enough grease to last for a year. The steering wheel is situated in the middle of the cab within easy reach of the control levers. The hood and cab are made of sheet metal fastened to an angle iron frame, the hood being equipped with hinged doors for access to the motor.

The tractor is manufactured by the Lenox Motor Car Co., of Boston, Mass.

Street Watering with Electric Vehicles

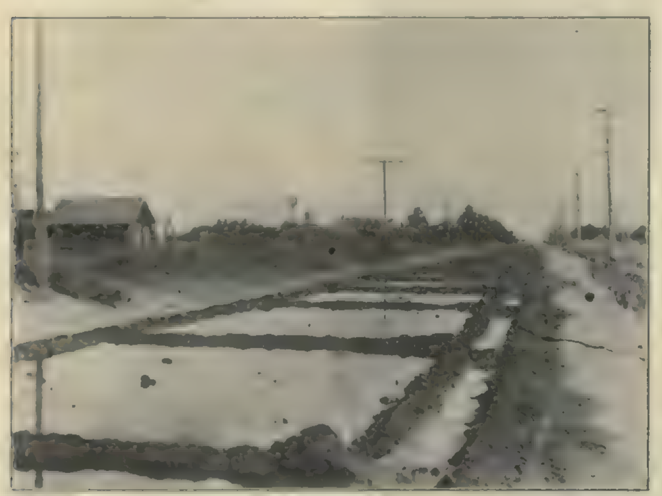
The success of the electric vehicle for street watering has been demonstrated in Blackpool, England, according to A. Jackson Marshall of the Electric Vehicle Section of the National Electric Light Association.

The vehicle used in that city is a 3½-ton unit carrying a cylindrical, 750-gal. tank. The discharge is at the front of the vehicle, thus permitting better control by the driver. As a rule the sprinkler takes care of about 25 miles of street in the morning, after which the batteries are given a boosting charge of an hour before the afternoon's work. The recharging of the batteries requires six hours and is done at night. In this particular case the current for recharging is obtained from the refuse destructor plant.

It is stated that in spite of the seemingly high initial cost of the sprinkler the record at the end of the year shows a considerable saving over horse-drawn vehicles. An order for a second sprinkler has been placed by the city and with the two in operation horse-drawn sprinklers will be dispensed with.

Curing Concrete Pavements

Wherever concrete can be cured by ponding, that method is preferable to all others, according to the engineers of the Portland Cement Association.



CURING CONCRETE PAVEMENT BY THE "PONDING" METHOD—SHOWING LONGITUDINAL DIKE AT THE RIGHT.

This method, it is stated, was probably first used in California and since then has been improved upon by the addition of a longitudinal dike near the edge of the concrete, as shown in the accompanying illustration. Where water is not readily obtainable it is desirable to prevent unnecessary loss, and this is accomplished by the longitudinal dike which also makes it certain that the concrete will be covered at the crown of the pavement as well as at the sides.

Cement and Concrete Testing at the Lewis Institute, Chicago

The Portland Cement Association has announced the making of an agreement with the Lewis Institute of Chicago for the joint operation of the structural materials research laboratory at the institute.

The laboratory has had as its objects the carrying out of experimental research in concrete, reinforced concrete, and concrete materials, and the giving of instruction to engineering students at the institute, on the properties of concrete and other materials of construction. The present laboratory occupies about 8,000 sq. ft. of floor space in the basement of the institute building at Madison and Robey Sts, and has facilities for conducting all the usual physical tests on concrete and concrete materials. The equipment includes a 200,000-lb. Olsen testing machine, a 40,000-lb. Riehle testing machine, two briquette testing machines, a Deval abrasion machine, a standard ball mill, a torsion machine, a concrete mixer, a Talbot-Jones rattler, a rock crusher, a silt washing apparatus, sieve shakers, extensometers, and other apparatus. It also has adequate facilities for making and storing mortar and concrete test cylinders, and as an adjunct there is a chemical laboratory fitted up with the necessary apparatus for studying the impurities of sands.

A considerable portion of the laboratory's work has been carried out in cooperation with various committees of the American Society for Testing Materials and with the American Railway Engineering Association, the National Conference on Concrete Road Building and other organizations. Included in the experimental work already undertaken and now in progress are the following: A comparison of the results of tests of mortar and concrete, using 23 different lots of cement; the effect of fineness of grinding of cement on the strength of mortar and concrete; a study of the impurities affecting the concrete-making qualities of natural sands; wear tests of concrete with reference to its use on roads; the effect of variation in the consistency on the strength of concrete; a study of concrete aggregates; the use of mechanical sifters for determining fineness of cement, and standard methods of cconcrete testing. In adition to the foregoing, there are under way several investigations bearing on the development of a standard procedure for conducting routine tests of cement, concrete aggregates and concrete. At present the laboratory makes about 40,000 tests a year.

The laboratory work is carried out under the immediate direction of D. A. Abrams, C. E. Mr. Abrams is a member of the American Society for Testing Materials, the International Association for Testing Materials, the American Concrete Institute, the American Mathematical Association and other organizations. He is also a fellow of the American Association for the Advancement of Science. The chemical investigations of the laboratory are in charge of Oscar E. Harder, Ph.D. Mr. Harder is a member of the American Chemical Society, the Institute of Metals, the American Association for the Advancement of Science, and other organizations. The assistants are Arthur Hagener, B.S., H. S. Young, L. E. Goit, B.S., and W. H. Kuhn, B.S.

New Brick Pavement Specifications

Two new sets of specifications have just been issued by the National Paving Brick Manufacturers Association, one for brick pavements of the green concrete foundation type, and the other for brick pavements of the sand-cement superfoundation type. Each specification covers both city streets and country roads and each is for cement grout filled pavement. Both specifications are printed in attractive booklets, 6 by 9 ins. in size and of the same general arrangement.

The booklet dealing with pavement of the sand-cement super-foundation type contains complete specifications for the construction of brick pavements laid upon various foundations with a super-foundation not more than 1 in. in depth composed of one part of cement to four parts of sand, stone screenings, or granulated slag. Specifications for street pavements and country roads are given separately. It is illustrated by several excellent halftones showing pavements of the type described at various stages of construction

The booklet dealing with the construction of the pavement of the green concrete foundation type contains two sets of specifications, one for brick street pavements and one for brick country roads, printed separately, as in the other booklet. It is illustrated in the same manner as the other, but contains in addition to the construction views a number of other views showing completed roads.

NEWS NOTES

The City of Santa Monica, Cal., has adopted the policy of bidding on its own public works. When its bids are successful, it is stated, local labor will be used entirely.

A ½-Yd. Concrete Mixer, Mounted on Car Wheels, has been used successfully in Kansas City, Mo., for laying concrete foundations for pavement between the rails of street car tracks. A rate of 20 cu. yds. per hour was made on the work.

Shortage of Labor is reported from various parts of the country. In Illinois, according to reports, contractors have been unable to bid on road work in some sections because of the impossibility of securing workmen. Similar conditions prevail in some parts of other states.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. L.
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NEW YORK, OCTOBER 14, 1916
Number 16

ALLAN J. PARRISH CONTRACTOR WHO IS BUILDING BRICK PAVEMENT IN EDGAR COUNTY, ILL.

THE VISITORS WERE ENTERTAINED AT A BARBECUE AT PARIS, ILL.

Annual Meeting of the National Paving Brick Manufacturers' Association

The 13th annual meeting of the National Paving Brick Manufacturers' Association was held at the Deming Hotel, Terre Haute, Ind., October 5 and 6. C. C. Blair, Youngstown, O., President of the organization, presided at the business sessions.

The program for the first day included the address of the president, a report on the association work by Will P. Blair, Secretary, and a report on the publicity work of the organization by H. H. Macdonald, Assistant Secretary.

All of the officers were reelected, as follows: C. C. Blair, Youngstown, O., President; J. W. Robb, Clinton, Ind., Vice President; Will P. Blair, Cleveland, O., Secretary; C. C. Barr, Streator, Ill., Treasurer; H. H. Macdonald, Cleveland, O., Assistant Secretary.

The new directors are: J. B. Wilcox, Alliance, O.; Eb Rodgers, Alton, Ill.; W. N. Alderman, Athens, O.; C. C. Barr, Streator, Ill.; C. C. Blair, Youngstown, O.; G. O. French, Canton, O.; R. C. Burton, Zanesville, O.; Will P. Blair, Cleveland, O.; J. W. Robb, Clinton, Ind.; C. J. Deckman, Cleveland, O.; J. G. Barbour, Canton, O.; F. L. Manning, Portsmouth, O.; J. L. Murphy, Nelsonville, O.; John Kline, Wickliffe, O.; R. A. Doan, Nelsonville, O.; G. E. Carlyle, Portsmouth, O.; J. R. Zmunt, Cleveland, O.; C. P. Mayer, Bridgeville, Pa.; H. C. Adams, Danville, Ill.; G. H. Francis, Greensburg, Pa.; F. W. Lucke, Chicago, Ill.; D. R. Potter, Clarksburg, W. Va.; J. H. Simpson, Dayton, O.; E. M. Grant, Morgantown, W. Va., and S. R. Strong, Seattle, Wash.

WATCHING THE DEMONSTRATION OF BRICK PAVING NEAR PARIS, ILL

W. T. BLACKBURN, ENGINEER OF EDGAR COUNTY, ILL., WHO DEVELOPED THE MONOLITHIC PROCESS.

On October 6 there was an inspection of the brick pavements of Terre Haute, after which those attending the meeting went to Paris, Ill., to witness a demonstration of brick highway construction under the recently adopted specifications. The visitors were met at Paris by Commissioner Wilson, Secretary Bradt and Chief Engineer Marr of the Illinois State Highway Commission.

The demonstration illustrated the construction of a brick highway by successive steps from the preparation of the subgrade to the completed pavement. This work occupied the visitors until noon, when luncheon, in the shape of an old-time barbecue, was served in grounds nearby.

After luncheon, residents of Paris furnished a number of automobiles in which the visitors were taken on an inspection trip over the system of brick roads, comprising about 25 miles, all of which was constructed during the past three seasons.

At about 4 o'clock the visitors returned to Terre Haute and the annual dinner was held at the Deming Hotel in the evening.

The Twenty-Third Annual Convention of the American Society of Municipal Improvements

The twenty-third annual convention of the American Society of Municipal Improvements was held at the Robert Treat Hotel, Newark, N. J., on Tuesday, Wednesday, Thursday and Friday of this week. The actual work of the convention commenced on Monday with the meetings of various committees on specifications, although the first public meeting was not held until Tuesday. The meetings were well attended and a wide range of subjects of interest to municipal engineers was covered by the technical papers and the committee reports.

ANNUAL DINNER OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS, NEWARK, N. J., OCTOBER 11, 1916.

At the opening session on Tuesday morning, the address of welcome was made by Mayor Thomas L. Raymond of Newark. This was followed by the response on behalf of the Society by Louis L. Tribus of New York, and the presidential address by A. F. Macallum, Commissioner of Public Works of Ottawa, Ont., and President of the A. S. M. I. These addresses were followed by the reports of the Executive Committee, the Secretary, the Treasurer, and the Finance Committee, and by the appointment of three committees, one to select the next meeting place, one to nominate officers for the ensuing year, and one to attend to the making of resolutions for presentation to the convention. The remainder of the session was occupied by technical papers and the report of the Special Committee on Standard Tests for Bituminous Materials, the latter being the only matter of interest to highway engineers.

The report was presented by Prof. Arthur H. Blanchard of Columbia University, Chairman of the Committee. It included the text of a letter sent out by the committee during the past year to various chemists working with bituminous materials. This letter, after reciting the steps taken by the committee, requested chemists to send to the Chairman statements of the physical and chemical properties which they considered should be covered in specifications of bituminous cements for use in the construction of bituminous pavements, and other information of a similar character. As a result of the data gathered, the committee submitted for the consideration of the members of the society certain conclusions.

The first of these was, that it was the judgment of the committee, based on present knowledge, that the inclusion of the paraffin determination in paving specifications serves no useful purpose.

The committee also reported that it believed that specifications for bituminous cements for paving purposes should cover the following properties: (1) Proper consistency; to be determined by the penetration, melting point, float, or viscosity test, or other test to be devised; (2) proper binding qualities (no agreement was reached by the committee as to the tests for determining these properties); (3) stability including retention of physical and chemical properties, this to be determined, for asphalt, by the loss on heating and the consistency of the residue, or other tests to be devised, and for tars, by the distillation test and the consistency of the residue, or other tests to be devised.

The committee also reported that it believed that when the bituminous cement is combined with the mineral aggregate, the mixture should possess toughness, resistance to abrasion, malleability and stability, and that tests should be devised to cover the measure of each of these properties.

At the evening session on Tuesday the principal matters of interest to highway engineers, in addition to the papers, were the reports of the Committee on Legislation and Finance, Chairman F. J. Cellarius, Dayton, Ohio, and the Com-

(*Continued on page 171.*)

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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Entered in New York Post Office as Second Class Matter.

The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF GOOD ROADS, published weekly at New York, N. Y., for October 1, 1916.

State of New York, County of New York, ss.:

Before me, a Commissioner of Deeds, in and for the State and county aforesaid, personally appeared E. L. Powers, who, having been duly sworn according to law, deposes and says that he is the Editor and General Manager of Good Roads, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, and circulation of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

Publisher—The E. L. Powers Co., Inc., 150 Nassau St., New York, N. Y.
Editor—E. L. Powers, 150 Nassau St., New York, N. Y.
Managing Editor—No person holding title of Managing Editor.
Associate Editor—T. A. Hulbert, 150 Nassau St., New York, N. Y.
Business Managers—H. L. Powell, 150 Nassau St., New York, N. Y.; E. A. Lyman, 150 Nassau St., New York, N. Y.

2. That the owners are:

The E. L. Powers Company, Inc., 150 Nassau St., New York, N. Y.
E. L. Powers, President and Treasurer, 150 Nassau St., New York, N. Y.
H. L. Powell, Secretary, 150 Nassau St., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: No bondholders, mortgagees or other security holders.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is: (This information is required from daily publications only).

E. L. POWERS, Editor and Manager.

Sworn to and subscribed before me this 26th day of September, 1916.

(Seal) O. D. CONKLIN,
Commissioner of Deeds. Certificate filed in New York County Clerk's Office, No. 74; New York Register's No. 18026. Commission expires March 18, 1918.

The Twenty-Third Annual Convention of the American Society of Municipal Improvements

(*Continued from page 170.*)

mittee on City Planning, Chairman G. A. Parker, Superintendent of Parks, Hartford, Conn. These two reports were read by title. The report of the Committee on Street and Sidewalk Design, Chairman E. A. Kingsley, Consulting Engineer, San Antonio, Texas, was postponed until Wednesday morning. The report of the Committee on Traffic and Transportation on a Proposed Standard Form of Making Traffic Counts, Chairman J. C. Hallock, Engineer in Charge of Port Newark Terminal, Newark, N. J., was also presented on Wednesday morning.

The work of the convention at the Wednesday morning session included, besides the presentation and discussion of various papers, the election of officers for the coming year and the selection of the place of meeting for 1917. The nominating committee, which had been named the preceding day, reported the following officers for whom the convention instructed the secretary to cast one ballot: President, N. S. Sprague, Chief Engineer, Bureau of Engineering, Department of Public Works, Pittsburgh, Pa.; First Vice-President, E. R. Conant, Chief Engineer of Savannah, Ga.; Second Vice-President, George H. Norton, City Engineer of Buffalo, N. Y.; Third Vice-President, R. K. Compton, Chairman and Chief Engineer, Paving Commission, Baltimore, Md.; Secretary, Charles Carroll Brown, Chicago, Ill.; Treasurer, F. J. Cellarius, Dayton, Ohio.

Approximately a third of the papers included in the program dealt with matters within the province of the highway engineers and of town or city street officials. The length of the program made it necessary to read some of these by title and to postpone others from their scheduled time to a later session. Some of the more important papers will be given attention in "Good Roads," for November 4. The papers of especial interest to road builders arranged in the order in which they appeared on the program were as follows:

"Highway Construction in the Northwest" (illustrated with moving pictures) by George C. Warren, President, Warren Brothers Co., Boston, Mass.; "Street Cleaning of Savannah, Georgia, Method Employed, Cost Data, etc," by E. R. Conant, Chief Engineer, Savannah, Ga.; "Problems and Methods in Snow Removal and Disposal" by H. S. Richards, Superintendent of Maintenance and Repair, South Park Commissioners, Chicago, Ill.; "Flushing; Its Place in the Street Cleaning Field" by Raymond W. Parlin, Bureau of Municipal Research, New York, N. Y.; "Necessity for Limiting the Loads, Speed and Size of Vehicles" by E. W. Stern, Chief Engineer of Highways, Borough of Manhattan, New York, N. Y.; "The Passing and Conservation of Macadam City Streets and Country Roads" by George C. Warren; "Business System Applied to Street and Road Management" by Will P. Blair, Secretary, National Paving Brick Manufacturers' Association; "The Resurfacing of Old Brick Pavements with Sheet Asphalt at Columbus, Ohio" by T. H. Brannan, Superintendent of Asphalt, Columbus, Ohio; "The Proper Oil for Treating Creosoted Wood Blocks for Paving" by P. C. Reilly, Indianapolis, Ind.; "Treatment of Wood Paving Blocks" by C. H. Teesdale, U. S. Forest Products Laboratory, Madison, Wis.; "Concrete Paving Experiences" by K. C. Gaynor, Consulting Engineer, Sioux City, Iowa; "Vertical Fiber Brick and Wood Block Pavements in the South" by E. A. Kingsley, Consulting Engineer, San Antonio, Texas; "Granite Paving" by C. D. Pollock, Consulting Engineer, New York, N. Y.; "Granite Pavements in the Borough of Manhattan" by R. A. MacGregor, Assistant Engineer, Bureau of Highways, Borough of Manhattan, New York, N. Y.; "The Repaving of Broad Street, Elizabeth, N. J., with Grouted Granite Block" by Thomas E. Collins, City Engineer, Elizabeth, N. J.; "Attention to Detail, A Weak Point in American Municipal Work" by H. W. Durham, County Engineer of Bergen County, New Jersey, Hackensack, N. J.

On Thursday evening the attention of the meeting was given to the report of the Committee on Standard Specifications and the individual reports of its subcommittees on various kinds of pavements. The report was scheduled for presentation well toward the end of the session, but after the reading of a paper carried over from a previous session, a motion was made to proceed to the consideration of the specifications. This was passed and the entire session, which lasted until shortly after midnight, was devoted to the consideration of the reports made. Most of the discussion was on the specifications for bituminous concrete and those for sheet asphalt. Few changes were made in the existing specifications for those pavements taken up at the session. The reports of the subcommittees on wood block paving and all of the papers scheduled for presentation at the session were postponed to the closing session of the convention.

The social and entertainment features of the convention were especially well arranged and were taken advantage of by many of the members and guests. They included an automobile trip on Tuesday afternoon through the city and the county park system to Eagle Rock and Cedar Grove Reservoir; a tea for the ladies given by Mrs. M. R. Sherrerd, of Newark, on Wednesday afternoon; a banquet tendered by the city of Newark to the members and guests, at the Robert Treat Hotel, on Wednesday evening; a theater party for the ladies on the same evening; a trip by special train and boat for members, guests and ladies on Thursday afternoon, and a card party for the ladies at the residence of Mrs. E. S. Rankin, of Newark, on Thursday afternoon. The trip on Thursday included an inspection of the Port Newark Terminal and Municipal Dock, and a trip around New York harbor.

An exhibition of products of interest to those attending the convention was held in the corridor outside of the meeting room and in an anteroom adjoining. Among the exhibitors were the following:

"American City," New York, N. Y.
Atlas Company, Lincoln, N. J.
John Baker, Jr., New York, N. Y.
Barber Asphalt Paving Co., Philadelphia, Pa.
Barrett Co., New York, N. Y.
Pitoslag Paving Co., New York, N. Y.
Philip Carey Co., Cincinnati, O.
Concrete Appliances Co., New York, N. Y.
Dunn Wire-Cut Lug Brick Co., Conneaut, O.
"Engineering News," New York, N. Y.
"Engineering Record," New York, N. Y.
"Good Roads," New York, N. Y.
Granite Paving Block Manufactureres' Association, Boston, Mass.
W. & L. E. Gurley, Troy, N. Y.
Harris Granite Quarries Co., Salisbury, N. C.
Hastings Pavement Co., New York, N .Y.
Charles Hvass Co., Inc., New York, N. Y.
International Clay Products Co., Kansas City, Mo.
Jennison-Wright Co., Toledo, O.
Lock Joint Pipe Co., New York, N. Y.
"Municipal Journal," New York, N. Y.
National Paving Brick Manufacturers' Association, Cleveland, O.
National Pavement, New York, N. Y.
Pacific Flush Tank Co., New York, N. Y.
Portland Cement Association, Chicago, Ill.
Republic Creosoting Co., Indianapolis, Ind.
Southern Pine Association, New Orleans, La.
Standard Oil Co., of New Jersey.
Standard Oil Co., of New York
United States Asphalt Refining Co., New York, N. Y.
Warren Brothers Co., Boston, Mass.
Water Works Equipment Co., New York, N. Y.

COMING MEETINGS

October 18-19—League of Minnesota Municipalities.—Annual meeting, Red Wing, Minn. Secretary, Richard R. Price, University of Minnesota, Minneapolis, Minn.

October 26-28—League of Texas Municipalities.—Fourth annual convention, Hillsboro, Tex. Secretary-Treasurer, Prof. H. G. James, Austin, Tex.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary Robert F. Hall, 210 South La Salle Street, Chicago, Ill.

The annual election of officers and dinner of the American Road Builders' Association will take place November 3 at the headquarters of the Automobile Club of America, 247 West 54th Street, New York, N. Y.

MEETING

Society for Street Cleaning and Refuse Disposal

The second annual meeting of the Society for Street Cleaning and Refuse Disposal of the United States and Canada is in session in the assembly room of the Department of Street Cleaning Building, New York, N. Y., as this issue of "Good Roads" goes to press, the sessions having started yesterday morning and continued over today.

After the meeting was called to order yesterday by the President, John T. Fetherston, Street Cleaning Commissioner, New York, N. Y., an address of welcome was delivered by Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York, N. Y., to which Vice President G. B. Wilson, Toronto, Ont., responded.

The remainder of the program for the Friday sessions included the following papers: "Street Cleaning by the Wet Method," G. A. Hanna, Cleveland, O.; "Street Car Flushers," A. T. Rhodes, Worcester, Mass.; "Hand Sweeping," Richard T. Fox, Chicago, Ill.; "The New York Anti-Litter League," R. Ross Appleton, New York, N. Y. The reading of the papers was followed by a motion picture exhibition showing the work of the New York Street Cleaning Department.

This morning there was an inspection of the Street Cleaning Department's School of Instruction, after which the program called for the election of officers and the reading of a number of papers, details of which will be reported in the next issue.

Denton County, Tex., is considering a bond issue of $900,000 for the purpose of building a system of roads aggregatng about 225 miles.

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GOOD ROADS

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NEW YORK, OCTOBER 21, 1916

Number
17

Eighth National Good Roads Show of the American Road Builders' Association

The eighth National Good Roads Show, under the auspices of the American Road Builders' Association, will be held in Mechanics Building, Boston, Mass., on February 5, 6, 7, 8 and 9, 1917, in connection with the 14th annual convention of the association. This exposition will include exhibits by leading manufacturers of machinery and materials used in road and street construction and maintenance.

The program for the convention proper is now in course of preparation and will include papers and discussions on subjects connected with road and bridge building and street paving by men who are recognized as authorities on the subjects with which they will deal.

The National Good Roads Show, which for a number of years has been a feature of the conventions of the American Road Builders' Association, has increased in size and importance year after year. The coming exhibition takes on added importance on account of the great amount of road work planned for next year in view of the funds appropriated under the recently enacted Federal Aid law and the additional large sums to be expended by the various states and smaller units of government.

Mechanics Building, Boston, in which the convention and good roads show will be held, is admirably situated and arranged for the purpose. It is located on Huntington Avenue, convenient to the business district of the city and can be easily reached from the leading hotels. The building is well lighted and heated and is thoroughly modern in all its appointments. It contains ample space for practically any number of exhibits and is adaptable to exhibits of any size, as the accompanying floor plans indicate.

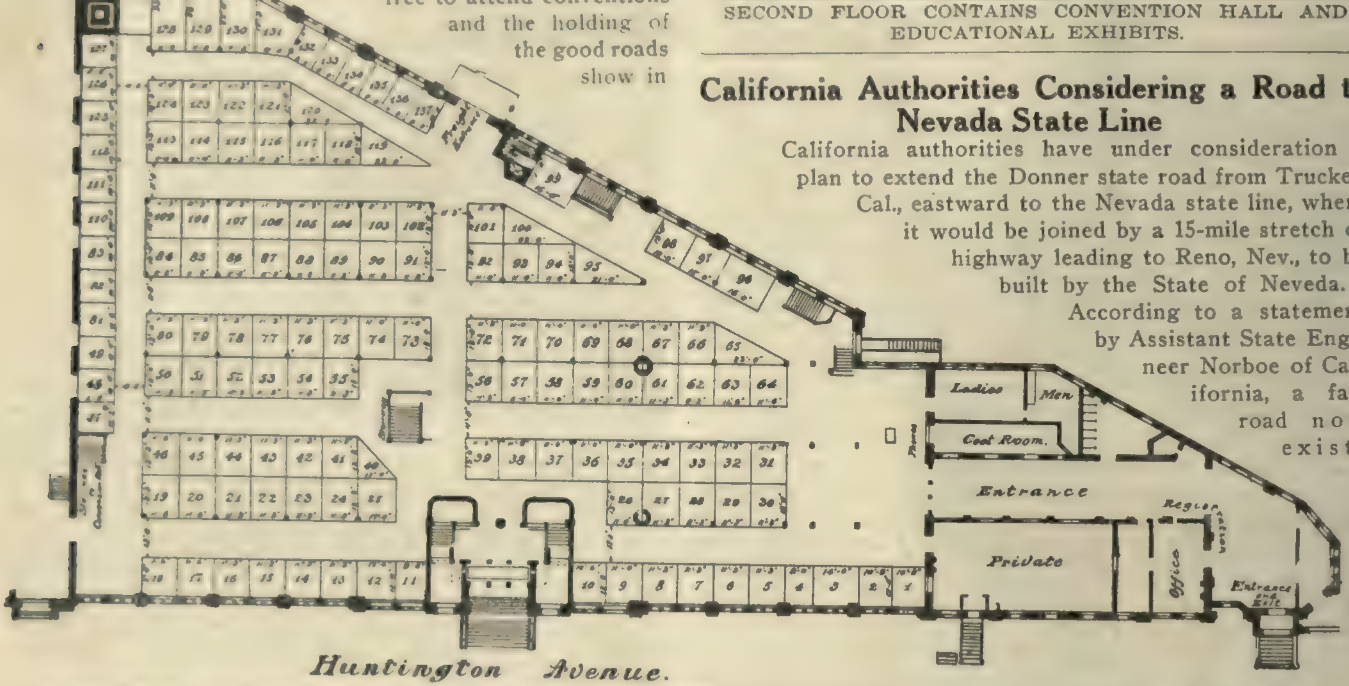
The plans for the good roads show, as completed by the Executive Committee of the American Road Builders' Association, contemplate the use of the ground floor of the building for the exhibition of heavy machinery, such as road rollers, graders, sprinklers, flushers, concrete mixers, etc., motor trucks, wagons, carts and other apparatus of a similar nature. Electric power will be available and many pieces of machinery will undoubtedly be shown in operation. The exhibition space on this floor embraces 11,287 sq. ft.

On the first, or main floor of the building, will be the exhibit of paving materials, mathematical and surveyor's instruments, road and street signs, light machinery, paving tools, etc. The main entrance, registration desk, offices, coat rooms for men and women and public telephones will be located on this floor, which contains 19,165 sq. ft. available for exhibition purposes.

MECHANICS BUILDING, BOSTON, MASS., WHERE THE EIGHTH NATIONAL GOOD ROADS SHOW WILL BE HELD.

The second floor contains the convention hall with plenty of space for a large gathering. The committee rooms are also on this floor. There are a number of booths for exhibition purposes, outside of the convention hall and in these it is planned to place the exhibits of various state highway departments and other exhibits of an educational nature.

The plan of holding the American Road Builders' Association convention and the National Good Roads Show in the early part of the year was decided upon a year ago and the attendance at Pittsburgh, Pa., in February of this year and the interest shown at that time in the work of the association, demonstrated the wisdom of this policy. It is during the early part of the year that road and street officials generally are comparatively free to attend conventions and the holding of the good roads show in February insures the attendance of contractors who, while anxious to keep abreast of the times with regard to new machinery, materials and methods, would nevertheless be unable to attend were the exhibition held later in the year, after the active work of construction had begun.



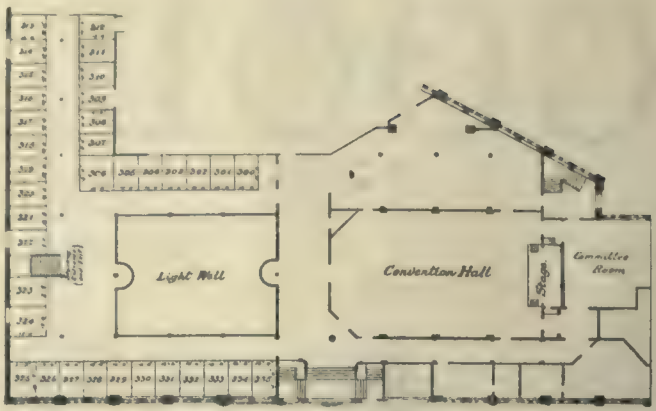
MECHANICS BUILDING, FIRST FLOOR, WHERE EXHIBITION OF PAVING MATERIALS WILL BE ARRANGED.

The management announces that it has secured the services of H. G. McConnaughy as Director of Exhibits. Mr. McConnaughy has had many years' experience in this line of work and is well known in connection with the management of the exhibitions held under the auspices of the American Electric Railway Manufacturers' Association.

New York Bureau of Municipal Research Training School

The first half-year of the Training School for Public Service held under the auspices of the Bureau of Municipal Research of New York City, will begin on November 14 and will be continued on Tuesday evenings for a period of fifteen weeks.

The sessions, which will take the form of conferences, will be held at the Automobile Club of America, 247 West 54th Street, New York City, and the subject will be "Municipal Highway Engineering." The instructor will be Arthur H. Blanchard, M. Am. Soc. C. E., Professor in charge of the Graduate Course in Highway Engineering, Columbia University.

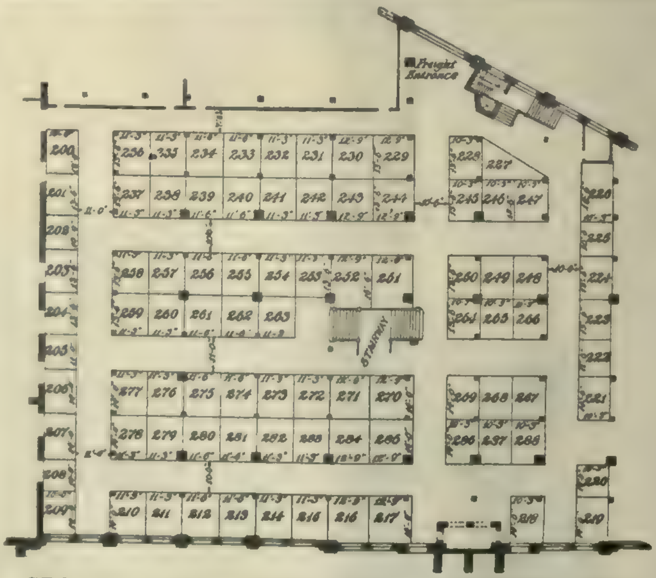


SECOND FLOOR CONTAINS CONVENTION HALL AND EDUCATIONAL EXHIBITS.

California Authorities Considering a Road to Nevada State Line

California authorities have under consideration a plan to extend the Donner state road from Truckee, Cal., eastward to the Nevada state line, where it would be joined by a 15-mile stretch of highway leading to Reno, Nev., to be built by the State of Neveda.

According to a statement by Assistant State Engineer Norboe of California, a fair road now exists between Truckee and Boca, a distance of six miles. The remainder of the California portion of the proposed road would follow the Truckee River canyon, giving a much easier grade than at present.



GROUND FLOOR, WHERE HEAVY MACHINERY AND MOTOR TRUCKS WILL BE SHOWN.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Robert Swan, Director of Public Works, Dies at Pittsburgh, Pennsylvania

Robert Swan, Director of the Department of Public Works, Pittsburgh, Pa., and well known as a civil engineer, died October 14, of heart disease, at his home in Pittsburgh. He leaves a widow, five sons and a daughter.

Mr. Swan was Vice President and General Manager of the T. A. Gillespie Co., contractors, of Pittsburgh and New York, for 20 years. He was born 56 years ago in Allegheny, Pa., and was graduated from the Western University of Pennsylvania at the age of 18, being the youngest man in his class to receive a degree in civil engineering.

He became City Engineer of Allegheny, Pa., when he was 24 years old and was connected with a number of the more important engineering enterprises in this country during the past quarter century. He was a member of a number of clubs, including the Duquesne Club of Pittsburgh and the Engineers' Club of New York.

Campaign for Half-Million Road Bond Issue in Dallas County, Texas

The Dallas County, Tex., Good Roads Association is conducting an active campaign for a bond issue of $500,000 for the purpose of raising what are known as the overflow roads of the county to a point above the high-water level.

J. F. Witt, County Engineer, has prepared for the County Commissioners' Court a report containing an extensive road building program which would involve the expenditure of $1,600,000. Included in the program, an outline of which was published in "Good Roads" for September 30, are items aggregating about $493,000 for the work contemplated by the proposed bond issue, which will be voted on at the November election.

The Dallas County Good Roads Association is of the opinion that to carry out the entire program at this time would place the county too near the limit of its bonded indebtedness. It was decided, therefore, to make a start on the overflow roads.

Lift Bridge to Be Built Over St. John's River at Jacksonville, Florida

The Board of County Commissioners of Duval County, Fla., has decided upon a bridge of the vertical lift type, with a 38-ft. roadway, to be built across the St. Johns River, connecting Jacksonville and South Jacksonville. The plans were prepared by Harrington, Howard & Ash, Kansas City, Missouri.

It is estimated that the cost of the structure will be about $850,000 and the question of issuing bonds for that amount will be submitted to the voters at the November election.

Commissioner Wiley of Kentucky Planning Against Delay in 1917 Road Work

Commissioner of Public Roads Rodman Wiley of Kentucky has sent a letter to all county judges in the state, urging them to take up the matter of 1917 road work at the earliest opportunity.

The letter suggests the cooperation of adjoining counties to the end that a number of main trunk lines may be secured and states that if contracts for 1917 work are awarded in February or March, more favorable prices may be secured than if the matter is deferred until later in the year.

Illinois Highway Department Changes System Regarding Plans for Road Work

Chief State Highway Engineer W. W. Marr, of the Illinois State Highway Department, has notified bidders on state aid road work of a change in the method of filing plans for road work.

Hereafter, instead of having complete plans on file at the offices of the chief state highway engineer, the county clerks and the county superintendents of highways, only plans and profiles, without cross sections will be available.

The complete plans, however, will be on file in the office of the division engineer in whose territory the proposed work is located and may be consulted there by prospective bidders.

The former practice of furnishing proposal forms from the office of the chief state highway engineer only, will be continued.

Barber Asphalt Paving Co. Establishes Fellowship for Asphaltic Research

With the cooperation of Harvard University and the Massachusetts Institute of Technology, the Barber Asphalt Paving Co., Philadelphia, Pa., has established at these institutions a fellowship for research in asphaltic materials and their uses. The fellowship is to be known as "The Clifford Richardson Fellowship." Mr. Richardson is a distinguished alumnus of Harvard, and this, taken in connection with his contributions to asphaltic highway construction and his work in the chemistry of bitumens, makes the designation of the fellowship particularly appropriate.

The appointment of the incumbent of the fellowship and the choice of subjects for investigation, as well as the disposition to be made of the results of such investigations as may be undertaken, are to be decided by the institute faculty or the joint committees of the university and the institute having control of engineering work.

COMING MEETINGS

October 26-28—League of Texas Municipalities.—Fourth annual convention, Hillsboro, Tex. Secretary-Treasurer, Prof. H. G. James, Austin, Tex.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

American Road Builders' Association

The annual meeting of the American Road Builders' Association will be held November 3 at the Automobile Club of America, 247 West 54th Street, New York, N. Y. The sessions will commence at 2 p. m., with a meeting of the Board of Directors. Aside from such action as the directors may take and the reports of the officers and standing committees, the principal interest of the meeting will center in the election of officers for the year 1916-1917. This is now being conducted by means of a letter ballot, but the polls will remain open until 4 p. m. on the day of the meeting.

The result of the election will be announced at the annual "get-together" dinner, which will be held in the grill room of the Automobile Club of America in the evening. It is expected that a large number of members and guests will attend this affair, which promises to be most enjoyable and instructive. A large number of reservations have already been made. The committee in charge of the arrangements for the dinner, is at work on a program and it has been decided to welcome at the dinner all who are interested in the good roads movement. All who desire to make reservations for the dinner are asked to notify the secretary of the association, 150 Nassau Street, New York, N. Y., as far in advance as possible.

MEETINGS

Motor Truck Club of America

The regular monthly meeting of the Motor Truck Club of America, Inc., held at the Automobile Club of America in New York on Wednesday evening, October 18, was devoted to a discussion of the subject, "Pending Legislation Affecting the Use of Highways by Motor Trucks."

The principal speakers were Eugene W. Stern, Chief Engineer of Highways of the Borough of Manhattann, and Charles G. Bond, of Coulter & Bond, the club's attorneys.

Mr. Stern described the damage done to pavements on 42d Street, 10th Avenue and 50th Street by the heavy tractors and trailers used by one of the subway contractors, showing the condition of the pavement at various places on those streets by lantern slides. In his remarks Mr. Stern also described in some detail the construction of the hauling equipment used by the contractors and reviewed the regulations imposed by law upon motor traffic in various cities.

Mr. Bond reviewed at some length the steps taken in the framing of regulations by the special committee appointed by the Commissioner of Motor Vehicles of New Jersey. Each clause in the regulations reported by the committee was taken up by Mr. Bond and was discussed by him and by others present.

Among those taking part in the discussion were Mr. Stern, Arthur H. Blanchard, Professor of Highway Engineering, Columbia University, and R. H. Gillespie, Chief Engineer of Highways and Sewers of the Borough of the Bronx.

PERSONAL NOTES

Edwin Doepers has been appointed City Engineer of Bloomington, Ill.

A. M. Porter has been appointed City Engineer of Redwood City, Cal.

M. J. Graham has been appointed County Road Engineer of Jefferson County, Tex.

Bert Paynter, Lawrenceburg, Ky., has been appointed County Road Engineer of Anderson County.

Sherry B. Smith has been appointed County Road Engineer of Franklin County, Ky., for a period of two years.

John Krohn, President of the Buffalo Concrete Paving Co., Buffalo, N. Y., died recently at his home in that city.

I. M. Flannigan, City Engineer of Madisonville, Ky., has been appointed County Road Engineer of Hopkins County.

D. R. Osborn, Corydon, Ky., has been appointed County Road Engineer of Henderson County to succeed S. H. Kimmel, resigned.

Charles M. Farrow has been appointed County Engineer of Limestone County, Ala. He was formerly Assistant County Engineer of Montgomery County, Ala.

NEWS OF THE TRADE

Manwaring & Cummins, contractors of Germantown, Philadelphia, Pa., have moved their offices to 5622 Germantown Avenue.

The Chain Belt Co., Milwaukee, Wis., has appointed C. F. Messinger, manager of the concrete mixer department. Mr. Messinger has for many years managed the company's advertising department. He is a graduate of the Sheffield Scientific School of Yale University.

The Sullivan Machinery Co., Chicago, Ill., announces that Burt B. Brewster, for the past two years manager in Alaska, with headquarters at Juneau, has been transferred to Salt Lake City, Utah, to become manager of the company's branch office, succeeding H. E. Moon, resigned. Walter F. O'Brien, who was associated with Mr. Brewster at Juneau, will take his place as manager in Alaska.

The Federal Government has appropriated $10,000 for the erection of sign posts to water holes in the Mojave Desert. The plan involves not only the marking of transcontinental highways with reference to water, but the keeping of the water supplies free from pollution.

Five Concrete Roads, 18 ft. wide, three to run the full length of Washington County, Wis., from north to south and two to run east and west, are proposed by the West Bend, Wis., Commercial Club. The cost would be $800,000, according to estimates and the club will start a campaign for a bond issue to raise the necessary funds.

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NEW YORK, OCTOBER 28, 1916

Number 18

Method and Costs of Building Concrete Roads With Thin Bituminous Tops in California[*]

By AUSTIN B. FLETCHER[†] and CLARENCE B. OSBORNE[‡]

The main trunk lines of the California state highways have been built with a concrete base covered with bituminous surfaces of various sorts, 15 ft. in width and of a minimum thickness of 4 ins. The roadway has been further widened by the addition of gravel or crushed rock shoulders for a width of 3 ft. on each side of the concrete, making a 21-ft. roadway.

The concrete base is made of a 1:2½:5 mix. The sand used is required to meet the usual specifications for grading and purity and also give a tensile strength at least equal to standard Ottawa sand in a 1:3 mortar at 28 days.

Great care is taken to insure the construction of a pavement at least 4 ins. in thickness and this has proven ample to withstand the traffic demands. After nearly four years of experience with 4-in. concrete there has been no reason shown for increasing the thickness.

In the mixing and curing of the concrete pavement it receives more nearly laboratory treatment than is usual in field practice. The aggregates and cement are of known tested worth prior to use. The proper consistency is maintained by care in the amount of water used in gaging. The concrete is kept wet by sprinkling for 24 hours and then cured under water for 10 days, the curing being usually accomplished by checking the road with low earthen dams and keeping the shallow reservoirs filled with water. Prior to the laying of the concrete the subgrade is wet and rolled until it is dense and thoroughly compacted so as to give a firm unyielding support to the concrete.

It has been said that no remarks dealing with California are complete without a mention of its "ideal climate." In this connection it may be said that the 4-in. minimum concrete pavement and the thin bituminous wearing surface have been built in a state where neither extreme cold nor long continued frost action are problems that have been necessary to consider.

The thin bituminous wearing surface is about ½ in. in thickness when completed. After it has been under traffic for a few months it is found to contain a fairly uniform mixture of mineral aggregate and bituminous binder consisting of about 8 per cent. to 11 per cent. of bitumen and the balance mineral aggregate of a fairly uniform grading running from dust to rock of ½ in. maximum diameter. This surface looks much like sheet asphalt, is firm under traffic and gives good traction. It shows no tendency to flow or creep, and the surface remains true and free from rolling. The concrete base, however, must be finished with a true, smooth surface to make a good riding highway, as this type of surfacing is not thick enough to smooth up to any considerable extent a concrete pavement whose surface is uneven.

The procedure in laying this thin wearing surface is as follows: First the surface of the concrete is cleaned of dirt, dust films and any thin coat of laitance. This is best accomplished by opening the bare concrete to traffic for a month or two. The iron-shod traffic and the rapidly moving rubber tires are of the greatest help in breaking any weak layers of dirt or laitance and exposing the surface of the concrete proper. This "traffic cleaning" is followed by brushing with revolving street brooms and hand brooms. In some cases a flushing of the surface with water is a help in washing off any thin coat of clay. It is of greatest importance that the asphaltic oil bind to the solid concrete and not to any overlying weak film of dirt. The care taken in getting a clean concrete is without doubt in a large measure responsible for the success of this surfacing because of the strength of the bond between the concrete and the bituminous wearing coat. The few failures where the wearing surface has been stripped from the concrete have been nearly always easy to trace to a pavement improperly cleaned prior to the application of the road oil.

After the concrete has been cleaned the asphaltic oil is applied by a pressure distributor at the rate of ¼ gal. per sq. yd. This oil surface is immediately covered by a layer of mineral aggregate, either crushed rock screenings or fine gravel of a maximum diameter of ½ in. and a minimum diameter of about ⅛ in. This material may contain some fines and dust, but should be a fairly clean material.

The screenings are applied by shoveling from piles placed at frequent intervals alongside of the road. The shovelers can be taught to so throw the screenings that they will cover the road surface with a fairly uniform thickness. The road can now with advantage be given a light rolling, but this is not necessary. Any excess of screenings should be swept into piles alongside of the road to be used on the second application of road oil. This is applied to the road at the same rate, as before, ¼ gal. per sq. yd., and is covered with screenings, as before.

The road is now thrown open to traffic and during the first few weeks may require further screenings to take up any excess of oil. The traffic is of great assistance in forcing the screenings into the oil and compacting and making a homogeneous bituminous carpet on the concrete.

The oil is applied to the road at a temperature of from 250° to 300° F. It is of asphaltic base, and contains approximately 90 per cent. of 80 penetration asphalt. In California the road oil companies classify this product as a "90-80" road oil. This method of classifying the oil does not, however, insure like physical properties for oils from different companies or from different oil fields. Two oils, both containing the same percentage of 80 penetration asphalt, may show very different physical properties. One may be so viscous that it is a semi-solid substance at ordinary temperatures, while another may be of such viscosity that it will be liquid. One oil may be sticky or cementing, while the other may be lubricating in its action.

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[*] Extract from paper entitled, "California State Highway Werk," presented at the annual meeting of the Washington State Association of County Commissioners, Tacoma, Washington, September 14-16, 1916.

[†] State Highway Engineer of California.

[‡] Geologist, California Highway Commission.

The road builder is especially interested in the physical properties of the road oil that is to be used. The solubility, volatility and chemical composition of the material furnish him with little information as to how the oil will act in the construction of a wearing surface.

In the building of the thin bituminous wearing surface for concrete pavements two physical properties of the road oil are of greatest importance. First the oil must be of such a viscosity that when applied to the road it will readily combine with the screenings that are thrown upon its surface. A very viscous oil will form a hard surface and the screenings will lie there without being absorbed and to a large extent be thrown off the road by the passing traffic. Only a small amount will settle or be forced into the oil and the surface will not build up into a satisfactory protecting wearing coat.

The second physical property of great importance is that the road oil must be cementing or adhesive so that it will bind tightly to the concrete surface and bind together all of the fragments of stone screenings. It should be an active cement and, if it is not sticky, then the wearing surface will not be firm enough to resist the push and pull of the passing traffic.

All road oils submitted for this type of surfacing are tested for viscosity and adhesiveness and must show in these two physical tests that they fall within the limits specified. The laboratory also tests the oil for percentage of asphalt, volatility, flash and burning point, specific gravity, and solubility in the usual solvents.

The oldest thin bituminous surfacing laid by the California Highway Commission has been under traffic for nearly four years on the main San Joaquin Valley highway just north of Fresno. This surfacing has in this length of time required almost no attention and today gives promise of a continued useful life before it will require renewal.

The use of the heavy asphaltic road oil in this type of construction has produced a wearing surface in which the cementing material is very much "alive." It readily mends if cut or broken.

The following cost data may be of interest. These data were obtained from the construction of over 600,000 sq. yds. of thin bituminous surfacing on ten sections of highway, having a total length of approximately 68 miles. The cost of the oil at the work, including heating and spreading, varied from $1.30 to $1.45 per bbl. of 42 gals. The screenings, on the job, cost from 53 cts. to $1.03 per ton. The total average cost of the surfacing was 8.03 cts. per sq. yd. This was made up of 3.90 cts. for materials and 4.13 cts. for labor, etc. The highest cost of any of these sections was 12 cts. and the lowest was 7.4 cts. per sq. yd. The highest cost of materials per square yard was 4.4 cts.; the lowest was 3.1 cts. The labor and other expenses varied between 3.5 cts. and 7.9 cts. per sq. yd.

Illinois State Highway Commission Will Spend $1,000,000 in 1917

For the fiscal year ending June 30, 1917, there will be $1,000,000 available for state aid road work in the various counties of Illinois. This amount is the last of the $2,000,000 appropriated by the Legislature in 1915.

The State Highway Commission has set aside $10,000 as a maintenance fund, and has alloted the remaining $990,000 to the counties. Of this sum Cook County will receive $108,994, or 25 per cent. of the total amount of automobile fees collected in the county. The other 101 counties will each receive an amount based on the ratio which the road and bridge tax of the county bears to the total road and bridge tax of the state.

The amounts allotted to the various counties are given in the subjoined table.

County	Allotment.	County	Allotment.
Adams	$9,591	Livingston	$15,880
Alexander	10,390	Logan	10,936
Bond	4,334	Macon	16,683
Boone	6,808	Macoupin	11,027
Brown	2,799	Madison	15,469
Bureau	19,764	Marion	6,042
Calhoun	1,596	Marshall	6,118
Carroll	7,407	Mason	6,336
Cass	6,893	Massac	1,552
Champaign	20,676	McDonough	7,987
Christian	12,912	McHenry	12,956
Clark	5,446	McLean	24,196
Clay	3,487	Menard	3,657
Clinton	4,851	Mercer	9,085
Coles	8,905	Monroe	2,896
Cook	108,994	Montgomery	10,818
Crawford	4,904	Morgan	9,304
Cumberland	3,220	Moultrie	5,626
DeKalb	15,482	Ogle	12,949
DeWitt	7,920	Peoria	21,744
Douglas	7,951	Perry	2,618
Dupage	11,266	Piatt	7,223
Edgar	13,529	Pike	8,664
Edwards	1,552	Pope	1,243
Effingham	3,904	Pulaski	1,987
Fayette	7,253	Putnam	2,585
Ford	8,503	Randolph	3,615
Franklin	6,185	Richland	3,337
Fulton	11,811	Rock Island	6,285
Gallatin	2,267	Saline	8,462
Greene	7,049	Sangamon	17,010
Grundy	8,841	Schuyler	4,587
Hamilton	3,489	Scott	3,370
Hancock	9,719	Shelby	11,904
Hardin	661	Stark	5,097
Henderson	5,107	St. Clair	10,085
Henry	13,027	Stephenson	10,348
Iroquois	19,294	Tazewell	9,240
Jackson	7,880	Union	2,526
Jasper	4,052	Vermilion	29,482
Jefferson	5,124	Wabash	2,846
Jersey	3,808	Warren	9,069
Jo Daviess	6,285	Washington	4,356
Johnson	984	Wayne	5,844
Kane	23,582	White	4,531
Kankakee	10,394	Whiteside	13,741
Kendall	6,050	Will	17,772
Knox	11,624	Williamson	5,440
Lake	11,953	Winnebago	14,042
LaSalle	28,384	Woodford	8,415
Lawrence	6,647		
Lee	10,461	Total	$990,000

Counties in Florida Spending $13,685,500 for Road Construction

Road bonds aggregating $13,685,500 have been voted by 34 counties in Florida. Several other counties will vote shortly on additional bond issues.

The work on the roads to be built under these bond issues has already been started and includes sand-clay, brick and rock construction. A large part of the rock roads are being oiled.

The counties in which the work is being done and the amount of bonds voted by each are given in following table:

County.	Amount.	County.	Amount.
Alachua	$40,000	Manatee	$250,000
Brevard	150,000	Marion	302,000
Broward	165,000	Nassau	240,000
Clay	150,000	Orange	600,000
Columbia	350,000	Osceola	400,000
Dade	517,000	Palm Beach	800,000
De Soto	760,000	Pasco	150,000
Duval	1,000,000	Pinellas	715,000
Hernando	260,000	Polk	1,500,000
Hillsboro	1,000,000	Putnam	223,000
Holmes	40,000	St. Johns	663,000
Jackson	345,000	Sumter	110,000
Jefferson	50,000	Taylor	600,000
Lake	500,000	Volusia	1,000,000
Lee	420,500	Wakulla	15,000
Leon	200,000	Walton	70,000
Madison	100,000		
		Total	$13,685,500

The National Assembly of Salvador has created a Bureau of Public Roads, to be known as Direccion General de Caminos. The bureau will be in charge of technical men who will make a study of all plans for roads and bridges with a view to working out a system that will provide means of communication for the entire country.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Examination for Position of Testing Engineer for Illinois Highway Department

An examination will be held at Springfield, Ill., on November 4 of applicants for the position of testing engineer under the Illinois State Highway Department.

The position pays from $125 to $200 a month and is open to non-residents of Illinois. Laboratory experience and the equivalent of graduation from a course in chemical engineering is required.

The examination will be conducted by the Illinois State Civil Service Commission, of which W. R. Robinson, Springfield, Ill., is Secretary.

Traffic Count Shows Increased Congestion in New York City Streets

Although a computation of the traffic on the main thoroughfares of New York, N. Y., was made only a few months ago, congestion has increased to such an extent that the Fifth Avenue Association recently had a supplementary count made in order to determine present conditions and to secure data on which to base recommendations for relief.

It was found that the intersection of Fifth Avenue and 42d Street is the point of the greatest congestion of vehicular traffic and the report shows that during the ten hours of the business day more than 17,000 vehicles pass going north and south, while the east and west traffic brings the figures up to at least 25,000, or an increase of about 1,000 a day over last year.

During the rush hour, between 3 and 4 o'clock in the afternoon, more than 2,500 vehicles pass the intersection. Allowing aggregate interruptions of 20 minutes during the hour, to permit east and west bound traffic to pass, it is figured that during the 40 minutes remaining for the north and south bound traffic, sixty vehicles a minute, or one every second, pass the intersection.

In order to relieve this congestion, the association's report urges the early completion of the viaduct over 42nd Street at the Grand Central Terminal. This would open up Park Avenue as a main thoroughfare for north and south bound traffic. The plan was approved by the city authorities about four years ago and it is stated that work will be started on the project in the near future.

More Than 900 Miles of Roads Now Being Built in Arkansas

According to a recent report there are now under construction in the State of Arkansas, a total of 916.13 miles of roads in various counties at a cost of $4,193,994. In addition to this work, the construction of approximately 1,200 miles of roads is in contemplation, the plan being to complete this supplementary work during the remainder of this year and the early part of 1917.

The location and mileage of the roadds now under construction, together with the estimated cost of the various units, are shown in the subjoined table.

County	Road	Length Miles.	Estimated Cost
Arkansas	DeWitt-St. Charles	16.58	$86,568
Ashley	Hamburg-Crossett	39.11	129,146
Cleburne	Higdon-Van Buren Co. line	6.29	17,477
Craighead	Jonesboro-Otwell	14.86	54,035
Crawford	Van Buren-Kibler	7.55	56,622
	Mountainburg-Locke	1.90	1,000
Crittenden	Earl-Hafer	10.00	19,150
	Hulbert-Riceville	43.39	126,454
Cross	Wynne-Crittenden Co. line	18.47	85,413
Desha	Arkansas City-Gainesville	8.00	6,466
	McGehee-McArthur	10.58	62,455
Faulkner	Conway-Saltillo	8.07	37,480
Hempstead	Dikes Springs	1.25	2,318
	Washington-Ozan	6.61	30,613
Jackson	Newport-Herring Chapel	10.20	67,281
	Newport-Beedeville	39.25	219,556
Jefferson	Cherry Street	1.50	13,010
	No. 15	39.36	195,755
	No. 14	19.45	93,939
	Barreque St. Ext.	....	8,010
	Pine Bluff	1.50	7,925
Johnson	Clarksville	34.81	189,177
Lafayette	Bradley-Spring Bank	10.65	69,356
Lawrence	Imboden-Jessup	18.60	56,394
	Walnut Ridge	22.23	105,707
	Strawberry	21.50	83,114
Little River	Norris Ferry-Lanesport	48.54	223,688
	No. 44	8.22	22,446
Mississippi	Blytheville-Big Lake	21.83	179,656
	Burdette	5.88	9,087
	Blytheville-Barfield	35.07	289,891
	Missouri line-Blytheville	13.90	129,454
	Etowa District	17.81	31,955
Ouachita	Camden-Stevens	20.50	95,098
	Camden-Nevada Co. line	15.70	33,897
Pike	Glenwood-Montg. Co. line	15.62	61,252
Poinsett	Marked Tree-Lepanto	15.92	88,396
Polk	Mena	50.66	233,784
Randolph	Pocahontas-Ravenden Spgs.	35.43	126,183
	Pocahontas-Missouri line	20.26	75,111
	Pocahontas-Clay Co. line	14.31	57,735
St. Francis	Madison-Craighead Co. line	56.22	246,419
Saline	River	9.69	16,193
Searcy-Van Buren	Leslie-Marshall	22.86	98,931
Sebastian	Ft. Smith-Mansfield	29.70	217,868
Sevier	Horatio-Oklahoma line	5.21	25,097
Washington	Morrow-Lincoln	8.50	9,285
White	Judsonia	8.93	15,965
Woodruff	Augusta-Fitzhugh	7.45	41,241
	Fitzhugh-Jackson Co. line	6.04	29,893
	McCrory-Jelks	15.17	61,048
Total		916.13	$4,193,994

A Consular Report states that the total mileage of metalled roads in the Straits Settlements is 587. Only nine miles of new roads were constructed in 1915, but $326,848 was spent for maintenance.

The Township Supervisors of North Huntingdon, Pa., have decided upon a plan to build 12 miles of brick roads at a cost of about $300,000. The question of issuing bonds for the township's share of the expense will be voted on at the November election.

COMING MEETINGS

November 16-17—Washington State Good Roads Association—Annual convention, Centralia, Wash. Secretary, John R. Rea, Tacoma, Wash.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

American Road Builders' Association

Prominent highway officials, among them Edwin Duffey, Commissioner, and H. Eltinge Breed, First Deputy Commissioner of the New York State Commission of Highways, have been invited to attend the annual dinner of the American Road Builders' Association, which will be held on the evening of November 3, in the grill room of the Automobile Club of America, 247 West 54th Street, New York, N. Y. The dinner follows the annual meeting of the association, which takes place in the afternoon at the Automobile Club of America. The principal business of the meeting will be the election of officers for the ensuing year.

The program for the dinner includes short addresses by leading members. Among the speakers will be Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York City, a past president of the association; Col. Edwin A. Stevens, Commissioner of Public Roads of New Jersey, the retiring president, and Arthur W. Dean, Chief Engineer of the Massachusetts Highway Commission, the incoming president.

The attendance at the dinner will not be limited to members and their personal guests, but the association extends a general invitation to others interested in the movement for improved roads and streets to make reservations at the office of the secretary, E. L. Powers, 150 Nassau Street, New York, N. Y.

Northwestern Road Congress

The third annual convention of the Northwestern Road Congress will be held in the Sherman Hotel, Chicago, Ill., December 7 and 8. It is planned to hold three sessions each day and a tentative program of papers, discussions and illustrated lectures has been prepared.

Among those whose names appear on the program are Prof. T. R. Agg, Iowa State College, Ames, Ia.; John A. Hazelwood, President Wisconsin Highway Commission; Henry G. Shirley, Chief Engineer Maryland State Roads Commission; W. D. Uhler, Chief Engineer Pennsylvania State Highway Department; W. W. Marr, Chief State Highway Engineer of Illinois; and H. J. Kuelling, County Highway Superintendent, Milwaukee County, Wis.

The 14th annual dinner of the Municipal Engineers of the City of New York, will be held on November 25 at the Hotel McAlpin, New York, N. Y. The secretary is George A. Taber, Park Row Building, New York, N. Y.

MEETING

The fourth annual convention of the League of Texas Municipalities is being held at Hillsboro, Texas. The sessions started on Monday, October 26, and will end today. The program includes several papers of interest to highway engineers. President E. H. McCuiston, Mayor of Paris, and Third Vice-President William H. Knight, Mayor of Hillsboro, presided at alternate sessions.

PERSONAL NOTES

J. L. Parsons has been appointed County Engineer of Webster County, Iowa, succeeding G. P. Smith, resigned.

W. W. Van Every, City Engineer of Sault Ste. Marie, Ont., has been appointed General Manager of the Water and Light Department of the city.

NEWS OF THE TRADE

Booklets on Concrete

"That Alley of Yours" and "Concreting in Cold Weather" are the titles of two booklets recently issued by the Portland Cement Association, 111 Washington St., Chicago, Ill.

The first, which carries the subtitle, "What Are You Going to Do About It?" is a 24-page booklet devoted to the advantages of concrete as a paving material for alleys in cities. It is profusely illustrated by views of alleys in which concrete pavements have been laid. Some of the illustrations are arranged in pairs showing the alleys before and after improvement. The booklet is printed in brown ink on cream colored paper, and is very attractively gotten up.

"Concreting in Cold Weather" is a treatise on the methods employed for placing concrete during extremely cold weather. It contains 16 pages and is illustrated by views of concrete construction protected from freezing.

Each booklet is 6x9 ins. in size and is well printed and attractively arranged.

Two other recent publications of the association are "The Concrete Road" and "How to Maintain Concrete Roads and Streets."

The former is a paper by Edward N. Hines, Chairman of the Board of County Road Commissioners of Wayne County, Mich., read before the meeting of the association at Detroit, Mich., in September. It deals with the writer's experience in concrete road construction in Wayne County and the conditions which developed in connection with the work.

The second is a leaflet containing suggestions for treating cracks and filling holes and depressions in concrete roads.

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Virginia Road Work

By G. P. COLEMAN*

The state of Virginia aids its counties and districts in highway work in three ways: by money for construction, by convict labor and by money for maintenance.

Under the law providing for money aid for construction, appropriations are made from the state treasury for the aid of those counties that cannot receive the benefits of convict labor, for no county can receive both convict labor aid and state money aid during any one year. The last legislature appropriated $190,000 and the automobile license fees to June 17 of $219,648, making a total for state money aid of $409,648. The amount is distributed to the counties according to the amount of tax paid into the state treasury by the county on account of real estate, personal property and capitation tax. Counties receiving money from the state are required to put up an equal amount. The resulting fund is known as the joint state and county fund, and the law requires that work done with it, as well as the convict labor work, shall be performed under the supervision of the State Highway Department. The work may be done by contract or all bids may be rejected and the work undertaken by the county authorities, but the cost of the same must not exceed the lowest bid received. In other words, the county or the local road authorities of a county can step in and take the place of the contractor. At present all of the counties of the state are receiving state aid, either in the form of convict labor or money.

Counties desiring convicts for road work make application through their local road authorities to the State Highway Commissioner for a camp of men. In the application they designate the road or roads to be improved and the amount of county funds available for the improvement. The proposed improvement is then investigated by an engineer of the State Highway Department, and if approved and the men and funds are available, requisition is made by the commissioner on the Superintendent of the Penitentiary for a camp. The camps vary in size from 35 to 75 men, depending on the class of work contemplated. The men are furnished to the counties free of all cost, that is, the state furnishes the camps and clothes, feeds, guards and otherwise takes care of the men, placing them on the road each morning free of all cost to the county. The county, on its part, agrees to furnish all tools, teams, machinery, etc., and to pay all foremen and free

A ROAD BUILDING PLANT IN OPERATION ON A VIRGINIA HIGHWAY.

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*State Highway Commissioner of Virginia.

labor necessary to carry on the work systematically and economically. This about equally divides the cost between the county and the state. At present, we have convict camps established in 34 counties, and are employing between 1,900 and 2,000 men. The last legislature appropriated for this purpose $190,000 and the jail fees, which will amount to about $60,000.

In this connection I have been recommending for a number of years the grading of the convicts of the state into four classes, as follows:

The first class would include long-term and dangerous prisoners, including all murderers and all prisoners whose records are known to be bad, and all prisoners sentenced for third offences. These men would be dressed in stripes and worked in stockades and under guard in the stone quarries and lime grinding plants of the state. At the present time the convicts who would be included in this class are kept in the penitentiary and are used on certain contract work.

The material from the stone quarries would be supplied to the counties of the state in which there is no suitable road building stone. The quarries would be located advantageously in different sections of the state, where we could avail ourselves of good transportation facilities. I feel satisfied that if this material was available for the construction of roads, the railroad companies would willingly give reduced rates. As a matter of fact, the railroad companies are now handling all material for county road work at a very low cost, thus aiding considerably in road improvement.

The second class would comprise short-term men, that is, men convicted for the first time and such men from class one as by experience we would find that we could trust. These men would be dressed in uniforms of blue or brown and distributed throughout the state to the various state road camps, to be worked under guard in the grading and actual construction of the roads. Men coming under this head are now being used in the road work of the state in the various camps previously referred to.

The third class would be composed of trusties, men taken from class two. They would wear ordinary khaki suits and would work, without guard, as roller-men, enginemen, cooks, yardmen, etc., in the state road camps. They would be used in small gangs to shape roads and lay stone, build concrete walls, bridges and headwalls. In every way they would be made to feel that they were in places of trust, and, above all, that they were being trusted. From 30 to 35 per cent. of the total number of men at present engaged in state work would come under this head.

The fourth class would be made up of paroled men who had been taken from class three and paroled for good behavior at some period in their sentence, on the recommendation of the State Highway Commissioner and the Superintendent of the Penitentiary. These men would wear ordinary clothing and would be assigned to the maintenance of the roads. They would be furnished with proper quarters, paid a monthly wage by the county for which they were working, and would be made a regular part of the state and county free labor road system, the only difference being that they would be required to report monthly to some general head and be governed by the parole laws of the state. These men, having been trained as prisoners in the construction of roads, it follows that they could use the knowledge thus obtained in the maintenance of the roads after construction.

With the consent of the Governor we have just inaugurated in six of the counties a plan following the suggestion of the preceding paragraph—that is, parolling the better class of trusties and using them in maintenance work, paying them a regular wage for this service and employing them in the same manner in which we would employ free labor. Should we be successful in this movement (and I have every reason to feel that we shall be), we will extend this plan to the whole convict road system, for I feel that the advantages to the state are very great, particularly in giving honorable employment to prisoners at the expiration of their sentences.

From an experience of ten years, I know of no work in which the prison classes can be better employed than in road construction—not only because it results in the up-building of the character and moral well-being of the prisoner and a general improvement of his health and physical well-being, but because he sees that good results are obtained from his work so that instead of destroying the community of which he is a part, he becomes one of the builders and improvers, in that he is constructing the roads which improve the state in which he is living. In this way you create in him a pride in the work which he is doing. I believe that in the course of a few years, the legislature of this state will give us the prisoners of all classes to be used practically as outlined in the foregoing.

The legislature of 1916, realized that if the counties and the state as a whole were to derive any permanent benefit from the investments which they were making, some provision must be made for the maintenance and upkeep of the roads and bridges after their construction. With this end in view, the State Highway Department drafted the "Automobile Maintenance Bill." Under this law all of the license fees received from automobiles and motor-cycles and garages, etc., are placed in a state maintenance fund. Prior to June 17 of this year, these fees had been used by the state to supplement the state aid construction fund, but those of us who had been in charge of state road work realized that some provision must be made for maintenance, therefore presented the bill as above outlined. Under this bill, the automobile licenses, which we estimate for the coming year will amount to between $300,000 and $350,000, will be distributed to all of the counties in the state in the same ratio in which the state money aid for construction is now distributed, the only difference being that the money from this source will be used in the maintenance of roads and bridges which have been constructed under state supervision. This law also requires that counties shall put up an amount equivalent to that contributed by the state.

The counties or districts of the state raise their funds to meet the state appropriations in three different ways: first, by direct appropriation from the general funds of the county; second, by the laying of special county or district levies, and third, by the issuing of county or magisterial district road bonds. The laws require that all of these funds shall be expended under the supervision of the State Highway Commissioner and according to plans and specifications prepared by the State Highway Department.

Eleven of the counties of the state have issued about $1,500,000 in bonds during the past year, and since the organization of the department, 40 of the counties have issued about $8,500,000 in bonds.

The state, for the year from October 1, 1916, to October 1, 1917, has made the following appropriations:

For the maintenance of the convict road force....	$190,000
and jail fees, which will amount to approximately	60,000
For state money aid....................................	190,000
For state maintenance, the fees received from the automobile and garage licenses, which will amount to approximately....................	350,000

In addition to this, there is available $25,500 for the State Highway Department. These funds, together with the various appropriations from general funds of the counties and special county and district bond issues, will give $3,250,000 for next year's work.

Since the organization of the department in 1906 we have expended approximately $12,000,000 in road and bridge improvement, and have constructed in that time a little over 4,400 miles of road and between 250 and 300 bridges.

VIEW ON A SECTION OF IMPROVED EARTH ROAD IN VIRGINIA—THE SCOTTSVILLE ROAD IN ALBEMARLE COUNTY.

Our most serious drawback at the present time is that under existing laws the funds are distributed to the hundred counties of the state and used in constructing small sections of unconnected road. The department, during the past year has supervised between 500 and 600 different pieces of work. We hope, however, that in the near future the legislature will establish a system of state highways and that the state and federal appropriations will be used in this class of work, and that the counties and districts will make their expenditures on secondary or feeder roads to the main state system.

Virginia will receive from the recent federal aid road bill, $100,000 the first year, $200,000 the second, up to $500,000 for the fifth year. It is the intention of this department, as far as possible, to use this fund, until a state system has been established, in connecting up unimproved sections of some of the main highways of the state, using always some road which would be ultimately included in a state system.

Road improvement will of necessity be very gradual in the state, since the road mileage, estimated at 52,000 miles, is large compared to the area of the state, and the distribution of the material for the construction of the heavier classes of road is poor and makes the cost excessive.

At the present time in the eastern section of the state most of the roads are being constructed of sand-clay and a lighter gravel. In the central section, east of the mountains, we are using top soils, the heavier gravels, and where possible, treated macadams, with some concrete.

In the mountain and valley sections the distribution of stone is very good and a great many miles of treated macadam are being put down. This will represent about 50 per cent. of the area of the whole state.

VIEW ON AN IMPROVED SECTION OF TOPSOIL AND GRAVEL ROAD IN VIRGINIA—THE BOYDEN PLANK ROAD.

A Resume of Maryland Highway Work

By HENRY G. SHIRLEY*

For the purpose of the road builder Maryland may be divided into four sections of different topographical characteristics. The western part of the state is mountainous, the elevations running up to 3,500 ft. above sea level. In this section the country is rough and the grades heavy. In the central part of the state the country is rolling and is devoted largely to agriculture. In southern Maryland the elevations range from 200 ft. down to sea level and the country is low and flat at the shore running back to a rolling and broken country in the interior. The "Eastern Shore" is flat and the soil is sandy. Many of the roads in this section are not more than 3 or 4 ft. above the level of the sea.

The climatic conditions vary fully as much as the topography. On the Eastern Shore and in southern Maryland the temperatures are moderate, while in the mountainous section of western Maryland temperatures of from 15 to 20 degrees below zero are not uncommon. During the winter there are a few cold periods on the Eastern Shore and in the southern portion of the state, but they are not of long duration and there is but little snow.

In the mountains in the western part of the state rock is, of course, abundant, and in central Maryland there are also many varieties of stone, the best trap and limestone occurring throughout that area. There is no stone in southern Maryland, but gravel is found in limited quantities, and on the Eastern Shore there are no hard materials, the soil being principally sand.

Road work in the state is carried on under three sets of laws. The first of these comprises the state road law under which the State Roads Commission constructs and maintains state roads at the expense of the state. The second is the state aid law. Under this the cost of the work is borne by the state, the county, and abutting property owners, the state contributing 50 per cent., the county 40 per cent. and the property owners the remaining 10 per cent. The roads are built in accordance with plans and specifications prepared by the State Roads Commission and under the supervision of that body. The third set of laws comprises the special laws under which the different counties operate. These provide for the construction of county roads and bridges under the jurisdiction of the county commissioners and under the supervision of the county road engineer, if there is a road engineer in the county. If there is no road engineer in the county the work is done under the supervision of the county commissioners or the road directors, as the case may be.

Revenues for state road work are raised by the issue of serial bonds running for 15 years. State aid money is secured by direct appropriation made at each session of the general assembly. County funds are derived by direct taxation or bond issue, depending upon the methods followed in the different counties.

The value of the road work done annually in the state amounts to about $5,000,000. This includes state and state aid funds and county money. The legislature in 1916 appropriated $2,700,000 for the continuation of the work on the state road system, and $300,000 annually for the state's 50 per cent. of the cost of state aid work. There is also available $450,000 from automobile license fees. This last is for expenditure in the maintenance of state and state aid roads.

A CONCRETE PAVED ROAD IN ALLEGANY COUNTY, MARYLAND

The roads built in the state have varied in kind from gravel and shell to the highest type of city pavements, including asphalt and wood block. In the western portion where stone is available a great deal of macadam has been put down, although concrete pavements have been built in the mountains under the most trying climatic conditions for the purpose of ascertaining their value in such localities. In this section there has also been used a bitumen-bound sandstone macadam. This has been put down in localities where no other metal is available. In central Maryland, except in the neighborhood of Baltimore, cement concrete and macadam are the most common types. In the vicinity of Balti-

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*Chief Engineer, Maryland State Roads Commission.

MACADAM ROAD SURFACE TREATED WITH COLD OIL—TALBOT COUNTY, MARYLAND

more, brick, asphalt, bituminous concrete, cement concrete, bituminous macadam, and water bound macadam have all been used. In southern Maryland most of the roads are of gravel or of cement concrete, while on the Eastern Shore bituminous concrete, cement concrete, macadam and shell roads are the prevailing types.

Under the recently enacted federal aid road law, the state of Maryland will receive about $600,000 of federal funds in the next five years. The principal road upon which it is expected that these funds will be expended is one leading from Washington to Annapolis. It is known as the Old Stage Road, or the National Defense Highway, and is about 25 miles long. The estimated cost is $375,000. In addition to this road, a road leading from Frederick to Buckeystown and Dickerson with a branch from Frederick to Urbana and Hyattstown will be improved.

New Jersey to Vote on a $7,000,000 Road Bond Issue.

At the coming election the voters of New Jersey will decide whether or not the state is to issue $7,000,000 in bonds for the improvement of the system of state roads designated in the Egan Bill.

A BITUMINOUS MACADAM PAVEMENT ON A HIGHWAY IN GARRETT COUNTY, MARYLAND

This bill, as has been noted in "Good Roads," was introduced in the last session of the legislature by Senator Charles Egan of Hudson County, was passed by the legislature and signed by Governor Fielder. As a referendum vote is necessary to authorize a state bond issue, the bill can not become a law unless acted upon favorably by the electors.

Briefly stated, the bill provides for a state system of roads, creates a commission to plan and lay out the routes specified in general terms in the bill, authorizes the issuance of bonds to the amount of $7,000,000 to pay for the work, provides means of retiring the bonds and specifies how the work shall be administered. The commission created by the bill is designated as the Highway Commission, and is to consist of the Governor, the President of the Senate, the Speaker of the House of Assembly, the State Road Commissioner, the Chairman of the Committee on Highways of the Senate, and the Chairman of the Committee on Highways of the House of Assembly of the 1916 legislature. The routes which have been previously described in "Good Roads" ("Active Campaign for $7,000,000 Road Law in New Jersey," "Good Roads", June 17, 1916, page 260) have a total length of about 555 miles and consist of a number of through routes extending across the state, down the Atlantic Coast and down the western side of the state from Trenton southerly, including a number of branches. The bill provides that these shall be laid out by the commission, taken over by the state as state highways and improved under the direction of the State Commissioner of Public Roads. It is further provided that the roads shall be paved with "granite, asphalt or wood blocks, brick, concrete, bituminous concrete, asphalt or other pavement having a hard surface and of a durable character." The width of all pavements, according to the bill, must be at least 18 ft., and of all roadways at least 30 ft. Sharp turns and railroad crossings must be eliminated wherever practicable and if possible grades must be kept down to 5 per cent. or less. The bonds must be of the serial type, all dated the same, the first $500,000 being pay-

THE HANOVER STREET BRIDGE AT BALTIMORE, MD., UNDER CONSTRUCTION.

able one year from date, the second $500,000 two years from date and so on until all are paid. They are to bear interest at 4 per cent. a year, payable semi-annually, and to be issued in denominations of not more than $1,000 nor less than $100. They are to be sold from time to time as money is required for the work. The interest and the principal coming due each year are to be paid out of money received from motor vehicle registration fees, license fees, fines and penalties, a sufficient amount from these funds being reserved each year for the payment of the interest and principal before being used for any other purpose except the expenses of the motor vehicle department.

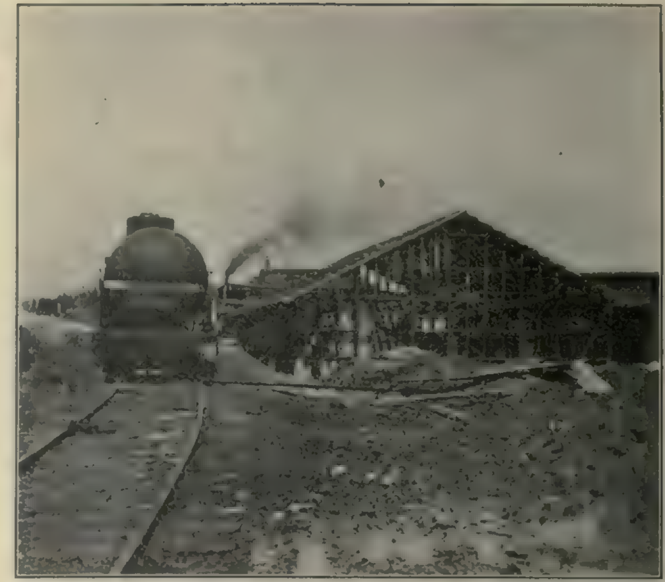
During the summer an active campaign has been conducted in behalf of the bond issue. It is understood that the plan of financing is not considered a practical one by the State Highway Department.

Road Oil Storage Plant of Davidson County at Nashville, Tennessee

A concrete tank for road oil has recently been constructed by the Turnpike Board of Davidson County, Tennessee, in cooperation with the State Highway Department. The tank is situated just outside the City of Nashville, and is used for storing and heating the oil purchased by the county for use on its roads. It has a capacity of 50,000 gals., and is both filled and emptied by gravity, being built almost entirely in an earth embankment beside and below the level of a switch on which cars containing oil for the county are placed. This arrangement gives a fall of several feet in the pipe lines extending from the cars to the tank. One of the accompanying illustrations shows the relative positions of the siding and the tank. There is also a fall in the discharge pipes which run through a trench to the road where the oil is delivered to a motor distributor.

The tanks are built in three units, set side by side, and having a total length of 48 ft., and a total width of 25 ft. 6 ins. The unit at the receiving end consists of four compartments—two 9 by 12 ft. in area, and two 8 ft. 7½ ins. by 12 ft. The next unit comprises four compartments of the same dimensions as those in the first unit. The third unit comprises three compartments—one 9 by 12 ft., and two each 9 ft. by 5 ft. 9 ins. All outside and dividing walls are 6 ins. in diameter except at the junction of the units. Where two units come together the end wall of each is 5 ins. thick and the two are separated by a ½-in. composition expansion joint. Running longitudinally through the center of the tank is a trough 4 ft. wide. As the 6-in. longitudinal dividing wall runs through this trough there is left a width of 1 ft. 9 ins. in the compartment on each side. This is occupied by the pipies. The compartments are 6 ft. 10 ins. deep at the outside, the floors sloping toward the trough at a rate of 1 in. in 5 ft. The floor of the trough slopes toward the discharge end of the tank at a rate of 2 ins. per compartment. It is 1 ft. below the floor of the tank at the discharge end. Each of the nine large compartments will hold about 5,000 gals., and each of the two smaller ones approximately 2,500 gals.

In each compartment is a steam-coil of 2-in. pipe, having a heating area of four times that of the coil in the car. The oil is heated to 350° F. in the tank and during hauling is kept at the proper temperature by burners on the county's motor distributor, which has a capacity of 1,000 gals. The oil lines consist of 3-in. pipe with ¾-in. steam pipe inside. The discharge pipes are located along each side of the trough at the bottom of the tank, with sleeve valves in each compartment, the valves being controlled by ropes running into a case at the top of the tank. The steam and oil lines are so arranged that one or all of the compartments can be utilized at one time, according to the quantity of oil required. The pipes were not installed when the photograph of the interior was made. The structure has a gable roof of corrugated galvanized iron, and has heavily reinforced side and end walls of concrete.

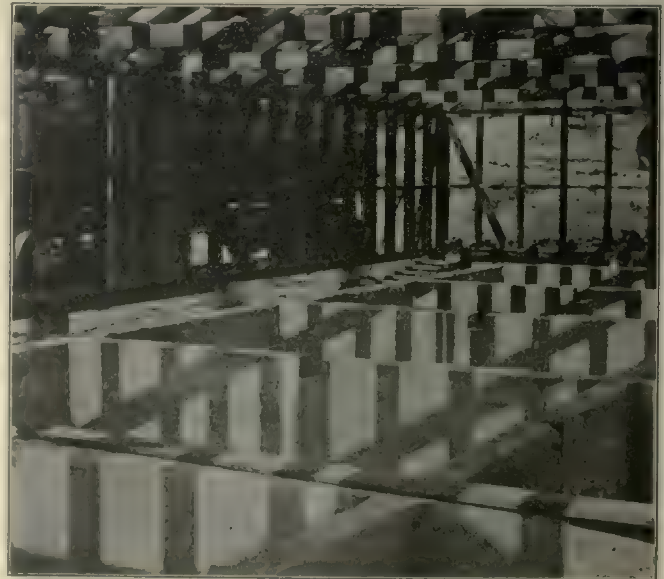


DAVIDSON COUNTY, TENNESSEE, OIL STORAGE PLANT UNDER CONSTRUCTION—SHOWING POSITION OF SIDING AND TANK HOUSE

One man can operate the entire plant, including the handling of all valves and cut-offs, and the firing and running of the boiler which is housed outside.

The tank was designed by Engineer Willis G. Walso of the State Highway Department of Tennessee. J. K. Rains of the County Turnpike Board supervised its construction.

Fire Destroyed the Wooden Floor of a Steel Highway Bridge and materially damaged some of the steel truss members at St. Charles, Mo., late in September. The structure carries a highway and the track of an interurban electric railroad over the Missouri River. It was built in 1903 and consists of 3 steel through truss spans, each 416 ft. long, one steel through truss span 300 ft. long, an approach consisting of a steel deck span 160 ft. long, at one end, and a wooden trestle approach at the other end. The wooden floor system consisted of 4x16-in. stringers, 6x8-in. cross ties, 3x10-in. longitudinal planking and creosoted flooring. The floor of practically the entire steel portion of the bridge and the whole timber approach were destroyed.



INSIDE VIEW OF OIL STORAGE PLANT OF DAVIDSON COUNTY, TENN., DURING CONSTRUCTION—SHOWING ARRANGEMENT OF COMPARTMENTS IN TANK

A Review of West Virginia Highway Work

By A. D. WILLIAMS*

Though one of the smaller states of the Union in point of area, West Virginia presents as varied problems in highway improvement as many of the larger commonwealths. The difficulties are due to several factors, among which are topography, distribution of road materials, and the condition of the road laws.

The eastern boundary of the state follows very closely the ridge of the Alleghenies, while on the west the Ohio River separates it from the state of the same name. The elevation above sea level ranges from about 550 ft. at Kenova, on the Ohio, to 4,860 ft. at the source of the Greenbrier River in the east. There are many rivers and creeks in the state, those in the northeasterly portion flowing in a general northerly direction and most of those in the remaining area flowing northerly and westerly to the Ohio and its principal tributary, the Kanawha. In many localities the road builder encounters steep slopes, and in some sections landslides are a serious problem. There are also great differences in the character of the soil and the available road building materials in different parts of the state.

A CONCRETE PAVED ROAD IN WOOD COUNTY, WEST VIRGINIA—SHOWING COMPLETED ROAD COVERED FOR CURING IN THE FOREGROUND.

West Virginia has a gross area of about 24,170 square miles. The extreme breadth (east and west) is about 200 miles and the extreme length (north and south) about 225 miles. The population is approximately 1,220,000, according to the 1910 census. There are about 31,600 miles of public roads in the state, of which about 1,700 are surfaced. During the past few years the road funds derived from county tax levies have varied from $640,000 in 1904 to approximately $2,500,000 in 1916.

The road building materials of the state consist of deposits of limestone, stream gravel, and clays and shales. Limestone occurs chiefly in the mountain counties in the eastern portion of the state. In the north central section thinner limestone deposits are found in the coal measures, but in many instances are not of suitable quality for road building. In probably one-half the entire arear of the state and about two-thirds of the portion devoted chiefly to agriculture the soil is soft and clayey, and hard rocks suitable for road building are present in only small amounts. Some of the sandstones, however, meet the requirements for aggregate in both bituminous and Portland cement concrete. Gravel, very well suited to the needs of the road builder, is found in abundance along the Ohio and other rivers, and proper raw materials for the manufacture of vitrified paving brick are very generally distributed. The border counties, as a rule, are better supplied with road building materials than are those in the central or interior counties, and the greatest problem in the matter of materials is that of transportation.

As in most other states, road work in West Virginia was carried on in a haphazard manner until a comparatively short time ago. During the legislative session of 1872-73 an attempt was made to compile the existing road laws. The legislature of 1881 made a similar attempt, at the same time amending the existing statutes to some extent and providing an alternate system of laws. Ten years later a second alternate system was provided and since that time various legislatures have amended and repealed existing laws and passed new ones with the result that at present there is a mass of legislation that is confusing and apparently, if not actually, contradictory.

The first step toward putting the road work of the state on a systematic basis was taken in 1907. In February of that year, the legislature passed a law directing the Governor to appoint a State Highway Inspector for a two-year term at $2,000 a year. The measure provided that the State Highway Inspector should investigate the road situation in the state and report to the Governor and the next legislature, including

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*Chief Road Engineer, West Virginia State Road Bureau.

HAULING STONE ON A WEST VIRGINIA ROAD JOB.

in the report such bills as he might consider necessary to remedy defects found in the existing laws. His duties were also to include collecting and reporting data on the work done in the various counties, the making of tests of road building materials, and the preparation and distribution of bulletins on the construction and maintenance of roads. The law directed the chemical and engineering departments of the University of West Virginia to make tests for the State Highway Inspector, charged the State Board of Agriculture with the duty of cooperating with him, and made it the duty of state, county and district officers to furnish information on his request.

In accordance with this law, Governor Dawson appointed H. E. Williams. Upon undertaking his duties Mr. Williams made a careful investigation of conditions in West Virginia and other states, giving especial attention to a study of the road laws of Massachusetts, Connectcut, New York, New Jersey, Pennsylvania, Illinois, Michigan and Missouri. In 1908 Mr. Williams made an exhaustive report to the legislature, including in it thirteen proposed bills. One of these provided for the establishment of a department of the state government to be known as the Office of Public Roads, and another provided for financial aid by the state. During the same year, 1908, the State Board of Trade requested the Governor to appoint a commission to act with the State Highway Inspector in the preparation of legislation. Governor Dawson complied with this request and the commission appointed considered the bills proposed by Mr. Williams and submitted a report to the legislature.

GRADING WITH A STEAM SHOVEL ON WEST VIRGINIA HIGHWAY WORK.

All of the bills recommended by Mr. Williams were introduced in the legislature of 1909. After consideration in both houses, bills were passed amending and reenacting some of the previous road laws, creating the office of State Commissioner of Public Roads, providing for county engineers, and defining the duties of the commissioner and the county engineers. The same legislature enacted a law providing for state aid, the necessary funds to be obtained from a direct state tax of one cent on each $100 of property taxable for state purposes, from the net earnings of the State Penitentiary over $20,000 annually, and from the proceeds of automobile license fees. Charles P. Light was appointed Commissioner of Public Roads by Governor Glasscock and took office on July 1, 1909. Commissioner Light organized his department by appointing Edward D. Baker, Chief Engineer and Ray C. Teter, Draftsman.

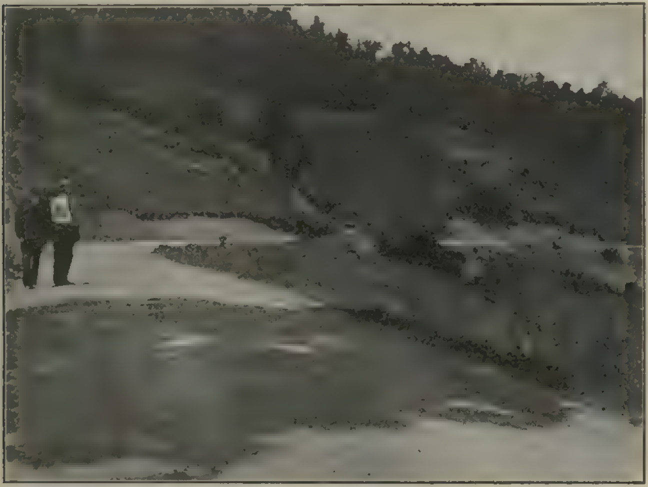
In 1911, before the state department had gotten fairly started, the legislature amended the 1909 law and abolished the state road fund and the office of State Commissioner of Public Roads, placing road work again entirely in the hands of the county authorities. This is the only instance in which a state has adopted state aid and then abandoned it. There appear to have been two reasons to which this retrogression was largely due. The legislature of 1909 reenacted an old law prohibiting townships and counties from contracting for the expenditure of funds before levying the taxes for raising them. For a long time the old law had been a dead letter, but in 1909 a penalty was prescribed for the violation of the reenacted statute. The observance of this made it impossible to complete plans for the expenditures of certain needed funds during the year following the inauguration of the state aid law of 1909. It was reported that this situation was made political capital of by the opponents of the state aid law. Another feature that made the state aid law unpopular in certain quarters was its failure to provide offices and salaries for about 1,800 precinct road supervisors who had previously had certain funds at their disposal for local road work.

A BRICK PAVEMENT ON A ROAD IN HANCOCK COUNTY, WEST VIRGINIA.

The law of 1911 provided for returning to the counties the sum of about $226,000 that had accrued to the state road fund. This was paid to the counties during 1911 and 1912 with no restrictions upon the method of its expenditure. It was used, but today there is nothing to show for it in any part of the state. This shows the fallacy of any money aid without state supervision.

The legislature of 1913 passed a new road law providing for the establishment of the State Road Bureau. This bureau, under the terms of the law, consists of the professor in charge of railway and highway engineering at the State University, who is the chief road engineer of the state and chairman of the bureau; the director of the Agricultural Experiment Station, and two members, not of the same political party, appointed by the governor. This law is still in force.

While the bureau has general supervision over the roads of the state the control of road work in the state is chiefly in the hands of the county authorities. In each county, except Preston, Pendleton and Tucker, there is a board of three county commissioners, one member being elected every two years for a six-year term. It is optional with the counties to appoint county engineers, one in each county, to have direct supervision over the road work. The engineer is appointed by the commissioners for a term of not over one year, at a salary of not to exceed $10 per day, if employed on that basis, or $1,500 per year, if employed by the year. An exception is made in the case of counties of over 45,000 inhabitants, in which the engineer's salary may be fixed at any amount not exceeding $3,000 annually. The engineer has charge of the construction of roads and bridges, and, as agent of the county commissioners, purchases machinery and materials.



AN ASPHALT MACADAM PAVEMENT ON A ROAD IN MERCER COUNTY, WEST VIRGINIA.

The principal functions of the State Board Bureau are to collect and compile statistics, furnish advice to county highway officials, prepare plans, specifications and estimates, upon request of county authorities, test all material used in the state for the construction and repair of roads and bridges, conduct an annual road school which each county engineer must attend for at least ten days each year, and, in short, to exercise general supervision over all public roads of the state so far as is consistent with the constitutional rights of the counties in respect to their authority over the roads. The bureau is also vested with authority to establish and operate stone quarries, crushers, and brick kilns, and to furnish materials to the counties. The headquarters of the Road Bureau are at the State University where there has been established a road material testing laboratory.

An important part of the bureau's work is the conduct of the road school. Sessions are held each winter and instruction in road and bridge work is given by means of lectures by experts from various parts of the country. The first school was held in February, 1914, and was attended by 150 road engineers, road officials and citizens. The second was held in December, 1914, with 153 in attendance, and the third in January, of this year, with an enrollment of 155. The fourth will be held the first week of January, 1917.

A WEST VIRGINIA WATER BOUND MACADAM ROAD.

The present personnel of the bureau is as follows: Chairman and Chief Road Engineer, A. Dennis Williams; John Lee Coulter, Director of the Agricultural Experiment Station; A. H. Gray; J. William Lynch. The staff consists of the following: Bridge Engineer, Dr. Roland P. Davis; Assistant Bridge Engineer, Lawrence Lee Jemison; Chief Chemist, Bert H. Hite; Physical Laboratory Assistant, Joseph Bierer; Statistician, Robert Duncan; Editor, Robert A. Kramer; Clerk, Marie Stenger; Stenographer and File Clerk, Roxie Pepper.

Funds for the prosecution of road work are obtained from county levies and bond issues. There is no state road fund, the money required for the maintenance of the State Road Bureau being an appropriation of $1,800 and $6,500 per annum. Bonds may be issued by a county or by the county for a district up to any amount provided that the amount of all bonds outstanding does not exceed in the aggregate 5 per cent. of the value of the taxable property in the county or district, as the case may be. Bond elections must be petitioned for by 100 voters, resident in the county, and 50 voters resident in any district, and a three-fifths vote is necessary to carry an issue. The bonds must not run for more than 34 years, must bear interest at not more than 6 per cent., and must not be sold for less than par. Interest and sinking fund

A BRICK PAVEMENT, 24 YEARS OLD, ON A STREET IN CUMBERLAND, WEST VIRGINIA.

charges must be met by an annual tax on all taxable property in the county. During 1913 bonds were voted to the amount of about $1,410,000. In 1914, $150,000 of bonds were voted. In 1915 the amount was $3,163,000, and in 1916 there has been voted $7,363,500 to Oct. 1, 1916, with $1,253,000 to be voted on during the next forty days. As has been stated, the annual income from county levies is at present from $2,000,000 to $2,500,000. Since the establishment of the State Road Bureau, Chief Engineer Williams has succeeded in having the type of bonds changed from sinking fund to serial, with the result that a saving of more than $3,000,000 has been made.

Convict labor is used to a considerable extent in the state, the present law permitting the use of both state and county convicts on the roads. During the period from July 1, 1915, to July 1, 1916, prisoners were employed with satisfactory results in two road camps, in which nearly 11,100 days' labor was done. In addition, over 140,000 days' labor has been performed by county prisoners during the past two fiscal years.

A ROAD IN FAYETTE COUNTY, WEST VIRGINIA.

During the fiscal years of 1914, 1915 and 1916 there has been built, or funds provided to improve, a total of 3,305 miles of roads. Of this total 600 miles are of brick and concrete, 932 miles are of water bound macadam, bituminous macadam and bituminous concrete, and 1,773 miles are of earth. Prior to 1913, a total of 571 miles had been improved.

At present there is available for road work in West Virginia, approximately $10,000,000, most of which has been raised by the sale of county road bonds. Additional bond issues are being voted from time to time, and, under the terms of the federal aid bill recently passed by Congress, West Virginia will receive approximately $800,000 in the course of the next five years. The expenditure of the funds now available and those to become available in the future will place great responsibility upon both state and county officials, and great ability and energy will be required to secure the best results for every dollar spent. With the small amount of money provided for its maintenance, the State Road Bureau is unable to serve the people of the state as fully as they need to be served. The present laws under which road work is carried on—those of 1909, 1913 and 1915—are a mass of confusion, and need radical revision. The next legislature convenes in January, 1917, and it is hoped that at that session there will be enacted laws providing for a system of state roads, for state aid, and for the use of the money derived from automobile license fees as a state aid maintenance fund. At present this money goes into the general funds of the state. As both political parties in the state have included in their platforms a plank committing them to state aid and a state road system, there appear to be grounds for expecting progressive legislation next year.

Cost of Brick Pavements[*]

The cost of brick pavements varies widely and is affected by so many influences that it is difficult to attempt to derive a general expression showing the relation between probable cost and local conditions. The prices of brick, as also the prices of the various materials entering into the foundation, vary greatly according to the locality and the freight rate. The cost and efficiency of labor is also far from being constant. Furthermore, the material composing the subgrade and the method of preparing it may exert a marked influence on the cost of the pavement. The following statements regarding cost, then, must be considered as representing average conditions, and care must be exercised in applying them to special cases. They are intended as a guide in preparing estimates of probable cost.

The grading is usually paid for by the cubic yard, and the cost, of course, varies with the character of the soil and the necessary amount of excavation. In light, easily loosened soils, grading may usually be done at from 25 to 40 cts. per cu. yd. In hard earth containing more or less loose rock the cost per cubic yard generally runs from 40 to 75 cts., while grading in solid rock may sometimes cost as much as $1.50 per cu. yd. The cost of the rough grading should be considered entirely apart from the cost of the pavement.

The cost of shaping and rolling the subgrade after the rough grading is completed will ordinarily vary from 3 to 5 cts. per sq. yd. This cost should be included with the other items which make up the cost of the pavement.

The cost of the curbs varies with the character of the material used. Stone curbs ordinarily cost from 25 to 75 cts. per lin. ft., while curbs made of Portland cement concrete cost, as a rule, from 20 to 50 cts. per lin. ft. The higher prices for the concrete curbs apply principally to special cases requiring extra form work or considerable extra material.

The cost of the foundation depends largely on the cost of the materials with which it is constructed. Gravel or broken stone can usually be spread and rolled at from 5 to 7 cts. per sq. yd., while the cost of these materials, delivered, varies from $0.60 to $2.00 per cu. yd. Mixing and placing concrete usually costs from 35 to 75 cts. per cu. yd., according to the amount of work to be done and the methods employed, and the cost of the materials, delivered, ordinarily varies from $2.50 to $4.50 per cu. yd. of concrete.

The cost of paving brick at the kiln varies from about $13 to $16 per thousand. Estimating 40 brick to the square yard, each 1,000 brick cover approximately 25 sq. yds., which makes the cost at the kiln per square yard of pavement vary from 55 cts. to about 65 cts. These figures mean very little, unless the kiln is located conveniently near where the brick are to be used, for freight charges not infrequently amount to more than the cost of the brick.

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[*] From "Brick Roads" by Vernon M. Peirce, Chief of Construction, and Charles H. Moorefield, Senior Highway Engineer, Office of Public Roads and Rural Engineering, printed as Bulletin No. 373, U. S. Department of Agriculture.

The amount of joint filler required varies of course with the thickness of the joints. If grout is used as a filler, it is customary to estimate about 1 bbl. of cement to each 25 sq. yds. of pavement. If a bituminous filler is used, not more than about 1 gal. of bitumen should be required for each square yard of pavement.

A force consisting of 1 paver and 5 laborers should place on an average about 220 sq. yds. of brick per 10-hour day; while supervision, rolling and incidental expenses are ordinarily equivalent to the cost of hiring about 3½ additional laborers.

If C = cost of cement per barrel, S = cost of sand per cubic yard, A = cost of coarse aggregate per cubic yard, B = cost of paving bricks per 1,000, and L = cost of labor per hour, with all materials considered delivered on the work and all costs expressed in cents, then the probable cost of constructing a brick pavement, including the subgrade, a 6-in. concrete foundation and suitable curbs, may be estimated by substituting in the formula:

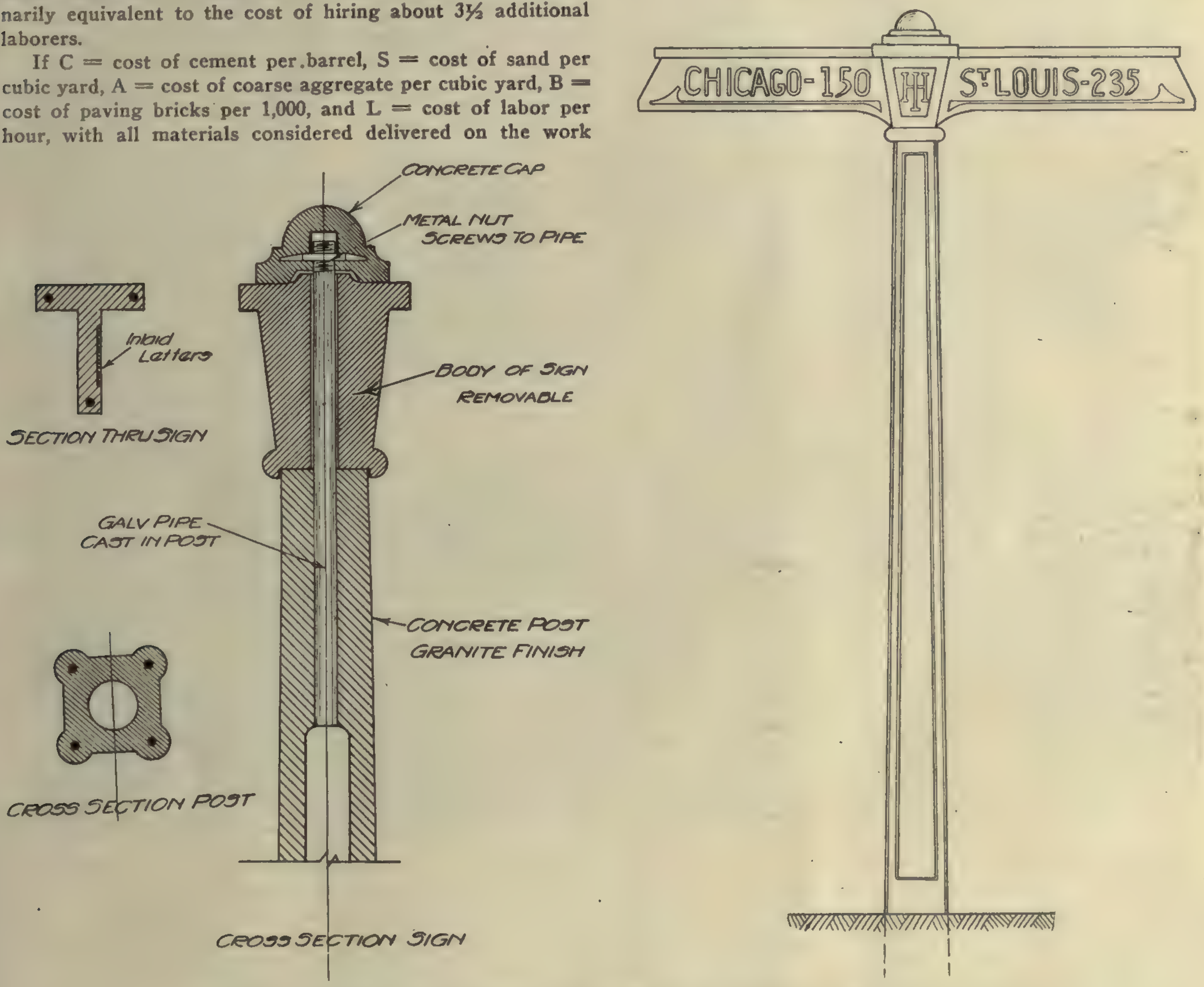
$$\text{Cost per sq. yd.} = 1.90\,L + .213\,C + .138\,S + .157\,A + .040\,B.$$

The cost as estimated from this formula should usually be increased by about 10 per cent. to allow for wear on tools and machinery and to guard against unforeseen contingencies. If it is desired to use a different thickness of foundation, it is safe to assume that each inch subtracted or added to the thickness of the foundation will make a corresponding difference of from 8 to 12 cts. in the cost per square yard.

Prize Design for a Concrete Road Sign

A design for a concrete road sign for which a prize was recently awarded by the Illinois State Highway Commission, is shown in the accompanying illustrations. The design was submitted in a competition held some time ago for the purpose of securing designs for road signs to be used on state aid roads. Walter H. Lienesch, Chief Engineer of the Universal Concrete Products Co., Chicago, is the designer of the sign.

The sign, as shown, consists of a concrete post through the center of which is a galvanized pipe, a removable signboard, and a concrete cap. The sign may have a single arm or may be built with two, three or four arms. These arms or signboards are of reinforced concrete, of a "T" section, with inlaid letters. The illustrations show a two-arm sign and horizontal and vertical sections through the post and a vertical section through the signboard.



DETAIL SECTIONS AND GENERAL ELEVATION OF PRIZE-WINNING DESIGN FOR CONCRETE ROAD SIGN FOR ILLINOIS STATE AID ROADS.

In Los Angeles County, California, there is being constructed a motor truck road of special design. The road will be a little over 18 miles long when completed and will connect Los Angeles harbor and the business section of the city. The pavement will consist of 8 ins. of 1:2:4 concrete covered with a thin wearing surface of asphaltic oil and screenings. The concrete will be 24 ft. wide and will rest on a 5-in. foundation course of decomposed granite laid to a width of 40 ft. The 8-ft. shoulder at each side of the concrete pavement will be built of decomposed granite.

Sand-Oil Roads in Massachusetts

By W. R. FARRINGTON*

The sand-oil roads constructed in Massachusetts are of two types—one constructed by the layer method and the other by the mixing method. Briefly described, the former are roads in which the component materials—sand and asphaltic oil—are applied in layers and mixed on the road, and the latter, those in which the materials are mixed and then laid. Differentiated thus, by the method of construction, the layer road and the mixed road may be considered analogous, respectively, to the bituminous macadam road and the bituminous concrete road.

While none of either type of sand and oil roads built in Massachusetts have so far failed, the layer roads have been built only in sections where the travel is comparatively light and none of the mixed roads have been subjected to any considerable amount of heavy traffic. For this reason it is impossible to state definitely the amount of traffic either type can safely carry. From observations made, however, it seems probable that the layer road will sustain only a light traffic and that this type is suitable only where conditions and available funds will not warrant building a more expensive road. On the other hand it seems probable that the mixed road will carry a fairly heavy traffic provided that the proportion of horse-drawn vehicles is not too great. This type of road, however, will probably not carry as heavy traffic as either bituminous macadam or bituminous gravel. Experiments with various sands and bituminous materials are being made, however, and it is probable that they will lead to some combination which will give a denser mixture and, therefore, firmer surface. This result may be obtained by grading the sand, adding cement and stone dust and using a heavier bitumen, and if such a mixture can be obtained at a not excessive cost it will be possible in those sections where sand is available but the cost of broken stone or gravel is prohibitive, to build a road which will sustain heavy traffic and will compare favorably with either a bituminous gravel or a bituminous macadam road. Such a surface will consist of a base, from 3 to 4 inches thick, of the ordinary mixture, with a 2- or 2½-inch wearing surface of a denser mixture.

SAWYER ROAD AT BOURNE, MASS.—SAND-OIL ROAD BUILT BY THE MIXING METHOD IN 1915.

The first road of the sand-oil type built by the Massachusetts Highway Commission was put down in the Town of Eastham on Cape Cod in 1905. At the beginning of the work the old sand road surface was shaped up roughly and hot oil was applied at the rate of about ¾ gal. per sq. yd., after which the road was harrowed. A week or ten days later oil was again applied at the same rate and the road harrowed a second time. Shortly afterward it was opened to travel but later a small amount of sand was spread over the surface and the road rolled with a horse-roller.

Before the completion of the road this method was abandoned in favor of the layer method which has since been developed to its present state.

The first mixed roads were laid in Wareham and Rochester in 1909, although some experimental work had been done during the previous year. This method has also been modified in some details since its first application.

In the present work with the layer method successive layers of sand and oil are placed on the prepared subgrade, the resulting pavement varying from 3½ to 4 ins. in thickness. The first step is naturally the preparation of the subgrade to receive the wearing surface. The subgrade is shaped and all sandy places hardened, usually by the addition of sandy loam or clay. Gravel is preferable for this purpose but it is not usually obtainable in those sections in which sand and oil roads are built by the layer method. After the preparation of the subgrade, oil and sand are applied alternately until the desired thickness has been built up. The total amount of oil used is either 1½ or 2 gals. per sq. yd., the former giving a thickness of surface when completed of about 3½ ins., and the latter of about 4 ins. When 1½ gals. are used, two applications of ¾ gal. each are made, while with a total of 2 gals. of oil three applications of 2/3 gal. each are ordinarily made. The ¾-gal. appplication is usually covered with about 1½ ins. of sand and the 2/3-gal. application with about 1¼ ins. When 1½ gals. of oil are used in the construction it is generally advisable to make a third application of ½ gal. during the spring following the completion of the work and this method is usually most satisfactory, as it has been found that sand-oil surfaces built by the layer method will develop weak spots and become more or less out of shape soon after completion. These imperfections in the road surface can readily be repaired when the final ½-gal. treatment is made during the second season.

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*Division Engineer, Massachusetts Highway Commission, Middleboro, Mass.

The bituminous material used for layer work should consist of some of the heavier grades of oil, such as are used for hot applications. Good results have been obtained with oils of viscosities varying from 200 seconds to 845 seconds (Lawrence viscosimeter at 100° C). As a rule, however, the best results are obtained with an oil whose viscosity is from 500 to 600 seconds. The specific gravity of the oil should be between .98 and 1.00 at 25° C. The oil should be applied by a distributor, preferably of the pressure type, the chief requirements being that the material be spread uniformly. Horse-drawn machines usually give better results than motor-driven distributors as the former do not have so much tendency to cut up the subgrade. While the oil should be heated in the tank cars in which it is shipped, it is well to have the distributor equipped with some heating arrangement so that the oil can be reheated on the job if necessary. The completed road should never be less than 15 ft. wide, and unless the shoulders are hardened from 16 to 18 ft. will be found more satisfactory, for the edge of the sand and oil surface will naturally be broken down by the frequent turning of teams from the roadway to the shoulders. The surface should be crowned not more than ½ in.

The sands used for layer work have varied considerably. Tests made show that the finest sand used was one of which 24 per cent. passed a 50-mesh screen and only 4 per cent. was retained on an 8-mesh screen, and that the coarsest was one of which 18 per cent. passed the 50-mesh screen and 12 per cent. was retained on the 8-mesh screen. To give the best results the sand should be clean, sharp and fairly coarse, although a comparatively fine sand can be used with the proper kind of oil. Good results have been obtained even with a sand containing a small proportion of loam, when the oil was carefully selected.

The cost of layer roads built by the Massachusetts Highway Commission has varied from 21 to 33 cts. per sq. yd., this price including shaping the subgrade, but not grading, culvert construction and other incidental work. The average cost on the same basis has been 26 cts. per sq. yd., while the average yearly maintenance cost has been about 1 ct. per sq. yd. on all roads except the first road at Eastham, on which the cost has been 2 cts. per sq. yd.

In the construction of mixed roads the present practice is to heat the materials, mix them in a mechanical mixer, spread them on the subgrade in either one or two courses, roll, and apply a seal coat.

The subgrade is prepared in practically the same manner as the subgrade for the layer road, sandy spots being hardened with gravel if possible, but usually with sandy loam or clay.

Up to the spring of 1915 pipe or arch heaters were used for drying and heating the sand. Since that time, however, revolving drum heaters with oil burners have been used with good results and these are largely replacing the pipe or arch heaters. The heater used is similar in its general features to the usual asphalt plant heater except that the drum is not enclosed, the flame being thrown directly into the drum or a combustion chamber at one end of the drum. The drum is inclined from the charging to the discharge end and is equipped with flanges on the inside which carry the sand to the top and then allow it to fall through the blast from the burners. While asphalt plants of the usual type have been considered for this work and used in one or two instances, it has been felt generally that the cost of such plants and of moving them from job to job is too great for work of this type. The sand must be dry as well as hot in order to secure the best results, and though sand which is fairly dry as it comes from the pit can be mixed in a hot mixer without preliminary heating, it is preferable to heat and dry it before putting it with the asphalt, as by so doing the time required for mixing can be reduced from five or six minutes to about two minutes.

FIRST SAND-OIL ROAD BUILT BY THE MASSACHUSETTS HIGHWAY COMMISSION—LAID AT EASTHAM IN 1905.

The oil is heated in kettles or tanks to from 250° to 375° F., the exact temperature depending upon the character of the oil. The two materials are then mixed either by hand or machine. Hand mixing was employed until the fall of 1912 but since then satisfactory result have been secured with mechanical mixers, which are now used on practically all of the work. An ordinary cube concrete mixer, operated by steam and equipped with a charging device and a heating attachment, has been used very extensively. The heating arrangement consists of an oil burner the flame from which is thrown into the mixer, the opening being lined with fire

TYPE OF DRIER, HEATER AND MIXER USED ON MASSACHUSETTS SAND-OIL ROAD WORK.

brick. Drum mixers have also been used and one type has burners so arranged that in loading, the materials do not pass through the flame. Similar mixers, both the cube and drum type without the heating attachment, have been tried, but while the results are satisfactory with gravel or broken stone, etc., the machines have not thus far given as good results with sand. From 15 to 25 gals. of oil or oil asphalt have been used per cubic yard of loose sand, but ordinarily the best results have been obtained with 16 gals. per cu. yd. of loose sand or 18 gals. per cu. yd. of compacted sand. The mixing is continued until all of the grains of sand are thoroughly coated.

As soon as the mixing is completed the mixture is carried to the road, spread, shaped with rakes, and rolled. The preliminary rolling is done with a horse-roller but should be followed later by a rolling with a tandem steam roller, the length of time between the two rollings depending on the temperature and general weather conditions. Ordinarily the tandem roller can be used in the afternoon on material spread during the forenoon of the same day. The material, as previously noted, may be spread in one course or in two courses. The former method is usually followed, although under certain conditions the two-course method may be preferable. While the mechanical roller is being used a road machine is kept at work on the roadway reshaping the surface and removing any inequalities which may have developed during the preliminary rolling. After the surface has been thoroughly rolled, a seal coat of about ½ gal. of hot oil per sq. yd. is applied from a pressure distributor in two ¼-gal. applications, each followed by the spreading of a light covering of sand. The oil should have a viscosity of from 250 to 600 seconds (Lawrence viscosimeter at 100° C). The seal coat adds about ½ in. to the thickness of the pavement.

The roadway should have a crown of not over ½ in. per ft. and a width of not less than 18 ft. The 18-ft. width is even more necessary for the mixed road than for the layer road, as the shoulders of the mixed road will break down under driving from the roadway to the shoulders even faster than will the edges of the layer road.

The sand used for the construction of roads by the mixing method should be fairly coarse and sharp, and to obtain the best results should be well graded. Satisfactory results can also be secured with a comparatively fine sand provided it is sharp and the grains are not of one size. A heavier oil, however, is necessary with sand of this character, and the finer the sand the greater the proportion of oil required. With sand having rounded grains which vary little in size, such as ordinary beach sand, very heavy oil asphalt is required. With sharper, well graded sands containing a considerable proportion of grains which will not pass the ⅛-in. mesh, an oil having a viscosity of from 800 to 1,700 seconds (Lawrence viscosimeter at 100° C) gives good results. Small amounts of clay or loam are probably not objectionable if well distributed throughout the mass, but as any considerable percentage of such materials is detrimental to the work, sand containing them should not be used except possibly when the available sands do not contain a sufficient proportion of fine grains to give the proper grading. The addition of stone dust and of from 5 to 10 per cent. of Portland cement to the sand gives a denser and stronger mixture but increases the cost. Cement and stone dust have not yet been used long enough to justify conclusions as to whether or not the results secured by the addition of these materials to the mixture warrant the additional cost.

The binder which has given the best results in work by the mixing method is an oil asphalt having a penetration of from 90 to 125 (Dow penetrometer at 25° C). Various other asphalts and oil asphalts have been used, the kinds varying from a hot oil similar to that used for hot blanket coats—that is, a material having a viscosity of about 600 seconds (Lawrence viscosimeter at 100° C)—to oil asphalt of from 90 to 150 seconds (Dow penetrometer at 25° C).

The average cost of mixed roads has been 52 cts. per sq. yd., varying from this to a minimum of 40 cts. per sq. yd. and a maximum of 61 cts. per sq. yd. This price includes the seal coat but does not include grading, culvert construction and other incidental work. Roads which have been in use at least five years have cost about 1.6 cts. per sq. yd. annually for maintenance while those in use three years have cost .75 ct. per sq. yd. The mixed roads built when the work was first started were not given a seal coat at the time they were built, but seal coats were applied a year or two later. A second seal coat has not yet had to be applied on any of the roads, but it probably will be necessary to reseal the existing roads once in four or five years at a cost of approximately 6 cts. per sq. yd. This will increase the yearly average maintenance cost to about 2½ cts. per sq. yd.

Idaho Road Work

Nearly all of the September issue of "The Idaho Engineer," a monthly publication gotten out by the executive committee of the Idaho Society of Engineers, is devoted to the subject of roads. Among the articles are, "Federal Aid as Affecting Highway Construction in Idaho," by State Highway Engineer E. M. Booth; "Roads Within and Adjacent to the National Forests," by Dana Parkinson, and "Work of State Highway Department," by A. L. Kahl.

In Mr. Booth's article it is pointed out that although federal funds are available for the current year, it will probably be about the first of next year before Idaho can take advantage of this act because of the present financial condition of the highway department and the necessity for the state to appropriate an amount equal to that allotted to it from the federal treasury. Of the $75,000,000 of federal funds available to the several states during the next five years, the State of Idaho will receive approximately $900,000, beginning with an initial appropriation of $60,000 and increasing by $60,000 annually to $300,000 during the fiscal year of 1920.

In addition to the federal funds for post roads, Idaho will receive about 12 per cent. of the $10,000,000 to be appropriated from the national treasury for the construction of roads in the national forests during the next ten years.

Mr. Booth points out that although Idaho will receive from these two sources over $1,500,000 during the next five years, this amount even when doubled by the appropriation of an equal amount by the state will build such a small portion of the system of main trunk roads at present planned that its greatest value seems to lie in the fact that it is an incentive to the state and the counties to continue road work. "Judging from the experience with state aid to counties during the past two years," Mr. Booth continues, "there is every reason to believe that this federal appropriation of $2,000,000 over a period of ten years will become the nucleus of a state and county expenditure of nearly ten times that amount, or a sufficient sum to complete the present outlined state highway system of trunk roads."

A Highway Bridge was Wrecked by the Derailing of a Street Car in Cleveland, Ohio, early last month. The structure, which is known as the West Third Street Bridge, crosses the B. & O. Ry. tracks and the Cuyahoga River. The span which was demolished was a through steel truss, 105 ft. long, over the tracks. The draw-span over the river was not damaged. The street car tracks approach the north end of the structure on a sharp descending grade, and just at the bridge there is a short curve to the right. Somewhere on the grade the motorman lost control of his car, which left the track at the curve, crossed over the north-bound track and struck the left-hand truss. Two people were killed and about 70 were injured.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

NOVEMBER 4, 1916

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THE REGULATION OF MOTOR TRUCK TRAFFIC

In New Jersey a special committee appointed by the Commissioner of Motor Vehicles has presented a report comprising suggestions for the radical regulation of motor vehicle traffic. In New York a similar committee has been appointed and is about to begin investigating the same subject. At a recent convention of the American Society of Municipal Improvements, Eugene W. Stern, Chief Engineer of Highways of the Borough of Manhattan, presented a paper describing the damage done New York City pavements by the use of unusually heavy trailers in carrying away material taken from subway excavations.

These are all indicative of the urgency of the problem forced upon road builders by the growing use of motor vehicles and the increasing weights of those vehicles.

It is now generally recognized that the motor truck has come to stay and there is every reason to believe that its use for hauling heavy loads over both country roads and city streets will very greatly increase in the near future. It is also certain that the builders of these vehicles will develop new types, but the nature of this development cannot be foretold. These facts must be given due consideration in the design and construction of roads and streets.

It is evident that some restrictions will have to be put on this traffic in the near future, if, indeed, regulation is not already necessary. Some extremists have urged the construction of roads capable of taking any traffic which might be put upon them. This, of course, is impracticable under present financial and traffic conditions. The more durable pavements are so expensive that they can be laid only on roads and streets carrying very heavy traffic in communities where the necessary funds can be secured without imposing unduly large burdens upon the taxpayers. Even could the more expensive pavements be put down on all roads, the problem would not be solved, for, as shown by the experience of New York City, the loads which motor vehicles can carry can be made so great and can be so distributed as to ruin any of the pavements in common use at present.

These facts indicate that the solution of the problem lies in the regulation of the traffic, and how this is to be accomplished is a problem that will require very careful study and the cooperation of road builders and the manufacturers of motor vehicles. Two points must be taken into account in any attempt to formulate rules and regulations which will relieve the situation. In the first place, the pavements already built must be conserved, and whatever restrictions are placed upon the use of motor vehicles must be such as to permit the continued use of the present standard pavement types. In the second place, account must be taken of the great number of trucks, tractors and trailers now in use and the existing standard designs followed by manufacturers. Any measures which do not take these factors into account will work a hardship on the manufacturers and will fail to properly protect the pavements—perhaps both.

In a discussion of the recommendations made by the New Jersey Commission, which was held at a recent meeting of the Motor Truck Club of America, there seemed to be a lack of the willingness to take a broad view of the situation which must be entertained by both the road builders and the truck manufacturers. There is no reason why the subject should beget a controversy with the manufacturers ranged on one side and the road builders on the other. Each of these classes, in its own way, is serving the public, and each must realize this to bring about wise action. Unquestionably the road builder knows infinitely more about road building than does the truck manufacturer, and conversely the truck manufacturer knows a great deal more about building trucks than does the road builder. The manufacturers, however, must build trucks to meet their customers' requirements, and the latter have interests which coincide exactly with those of the general public—they must use the roads for their equipment and both as truck owners and as citizens they must expect to bear their just portion of the expense of building and maintaining the roads.

A. S. M. I. CONVENTION PAPERS AND COMMITTEE REPORTS

Some of the more important papers presented at the recent convention of the American Society of Municipal Improvements at Newark are printed in abstract form on other pages of this issue. Others for which space is not available have been reserved for such use as is possible later.

The chief criticism that can be made of the papers at this meeting is that there were too many of them. During the four days of the convention there were seven sessions at which papers were scheduled for presentation. The program for these sessions included over forty papers besides a large number of committee reports and the routine business of the convention. The society interests itself in all municipal engineering matters, including pavements, but there were fourteen papers and six committee reports on the latter subject alone. Had the meeting taken up nothing but these papers and reports it would have had more than it could have done thoroughly.

It is a matter of regret that, although highway engineers and officials recognize that time spent in open discussion is as well spent as the time taken by any feature of a convention, the makers of convention programs seem to lose sight of that fact. The value of almost all conventions is materially impaired because the program provides too many papers and too little time for their discussion. The inclusion of so many papers is apparently due to an effort to cover the entire field of road and bridge construction and maintenance. The result is that in most programs there are many papers that are merely reviews of the outstanding features of current practice, with all of which the great majority of those present are thoroughly familiar. And it should be noted that this is by no means entirely the fault of the authors of the papers. A man is often put on a program without his consent—in fact, cases are not unknown in which an engineer has first learned that he was to present a paper by reading the advance program. Many engineers—especially, perhaps, those best qualified—do not have time for the careful and painstaking preparation of papers. In such cases it is only natural for them to hastily set down those things which most readily come to mind. The result, as might be expected, is a perfunctory resume of common knowledge, and it doesn't encourage a writer to make his paper any more than this if he knows that it is likely to be read merely "by title."

The A. S. M. I. program was less open than some others have been to adverse criticism on the score of perfunctory papers. But it was too full, as was evidenced by the number of papers that had to be read by title and by the number of papers and reports scheduled for presentation at a certain session that had to be postponed to a succeeding session whose schedule already included far too much.

The specification work of the convention was handled in a most unbusinesslike manner, especially at the evening session on Thursday, October 12, when the report of the Committee on Standard Specifications was acted upon. This report—doubtless the most important made to the convention—comprised specifications from sub-committees on asphalt paving, bituminous paving, broken stone and gravel roads, brick paving, concrete paving, stone block paving, wood block paving, and sewers. Each sub-committee report was put before the convention for adoption as submitted or for adoption with such amendments as might be made.

In the first place the consideration of the reports was scheduled late in the program which, had it been followed, would have necessitated an all-night session. This was fortunately obviated by the passage of a motion to take up the reports early in the evening.

Before the consideration of the reports had gone very far it became evident that the session would be a stormy one. The efforts of commercial interests to secure favorable recognition in the framing of the society's specifications are natural and need to be in no way inimical to the work which the organization elects to do in that field. Were the activities of these interests properly regulated by the society they could not subject it to adverse criticism. But that such regulation does not exist was amply demonstrated. Although companies handling road-building materials and the men connected with them are ineligible to voting membership, they were much in evidence at the Thursday evening meeting and were apparently well equipped with spokesmen who were in a position to inject their interests into the proceedings. Added to this was either an incomprehensible ignorance or utter disregard of the most elementary principles of parliamentary procedure. The result was that time and again it was apparent that those voting had only a hazy notion of what they were voting on, that motions were entertained when entirely out of order, that discussion was allowed when it should not have been and cut off when it ought to have been permitted. In short, the proceedings were such that an accurate, connected report will be impossible, and the validity of almost any action taken is open to question.

The weakness of the society's method of handling specifications seems to lie in the way in which sub-committee reports are brought before the members. Through the year and at the meeting the sub-committees work out certain standards for submission to the society. From the information available there appears to be no question as to the ability or fairness of the sub-committees. They do their work well, giving the manufacturers and dealers access to their meetings and according their claims careful consideration. Upon the completion of their labors the sub-committees report their findings to the convention and action is taken immediately without allowing enough time for the consideration necessary to enable the members to vote intelligently. And there seems to be nothing in the society's rules of procedure to prevent the manufacturers and dealers from bringing their claims before the convention itself and trying to influence the voting.

It is absurd to expect good results from such a system. The committee reports should be sent out far enough in advance of the convention so that when they are formally presented the members will be in a position to accept them or offer well-considered amendments, and the privileges of the commercial interests in the society's deliberations should not be extended beyond the committee meetings.

Unless the society adopts a different method in its specification work or leaves that work to other organizations it can hardly expect to enjoy the esteem which, under different methods of operation, it might reasonably expect to inspire in the members of the engineering profession.

ROAD WORK IN THE SOUTH AND THE SOUTHWEST

That the people in the southern and southwestern states are fully alive to the importance of road improvement is shown by the several articles on work in those states, printed in this and the preceding issue of "Good Roads."

The state aid principle has not been applied so long in the South as it has in the North, but there are now few southern states that have no highway departments and most of those that haven't yet provided for central road authorities are likely to do so in the not distant future. The passage of the federal aid law with its provisions for dealing with state highway departments wherever they exist has doubtless hastened legislation for their creation in states where there are none at present, but even without this spur to action it is probable that much progressive legislation would have been enacted at the coming sessions of the southern legislatures.

In one way, those states that have yet to establish state highway departments or inaugurate state aid are fortunate, for they have at their disposal the experiences of states in which state participation in local road work has been in operation long enough to have produced results worth studying. There are available especially valuable data on methods of financing, for instance. It is, of course, impossible to forecast accurately the action of a legislative body or the policy of a future state highway department, but with the example of some northern states before them there is no reason why any southern commonwealth should misapply bond issue funds. The folly of making short-lived improvements with the proceeds of long-term bonds has been thoroughly demonstrated.

Another phase of the work to which can be applied advantageously the lessons of other states' experience is the maintenance of state or state aid roads. The necessity for financial and administrative provisions for this has been shown time and again both by the making of such provisions and by the failure to make them.

Less help can be expected from the experiences of the older state aid states in the determination of the types of road to be built and the methods of construction to be followed. These are matters largely dependent upon local conditions and these, especially in the extreme South, are naturally very different from those in the North. While in many southern states frost action, snow and extreme cold do not have to be reckoned with, there are, on the other hand, factors such as peculiar soil conditions, heavy rains and lack of certain road building materials, that are equally trying. These, however, are technical details with which southern engineers are as competent to deal as are their northern brothers with the problems peculiar to the North.

Everything considered, the outlook for road betterment in the South and Southwest is bright. Enormous sums are and will be available for the prosecution of the work and the indications are that these funds will be expended, as a rule, wisely. Such expenditure, wherever made, will prove an investment that will yield handsome returns in dollars and cents as well as in less tangible but no less real benefits to the community.

Michigan to Use Federal Aid Money to Complete Trunk Line System

By D. A. THOMAS *

To use the money apportioned to Michigan during the next five years under the federal aid road act for the purpose of connecting up roads on the state trunk line system through the poorer sections of the state is the proposal of State Highway Commissioner Frank F. Rogers. With a view to using the money according to a definite plan covering the five year period, a method has been formulated by which, if enabling state legislation is passed, the trunk line roads of Michigan can be completed, or nearly so, with the government aid at the end of five years.

The establishment of a system of trunk line highways was provided for by the 1913 legislature. This system consists of a network of 4,785 miles of highways so laid out as to reach all the principal cities, towns, and villages in both the upper and lower peninsulas of Michigan, and to serve the state as a unit. During the past three years approximately 900 miles of trunk line roads have been built and over 1,000 miles more are applied for at the present time.

Under the highway laws now in force in the state, a bonus or reward is paid to all counties or townships on roads constructed according to the specifications of the State Highway Department. There are seven classes of roads varying from sand-clay construction to concrete and brick paved roads. The rewards vary from $250 to $1,700 per mile and these amounts are doubled if the road forms a part of the trunk line system.

The rules adopted by the Secretary of Agriculture for the administration of the federal aid road act and the requirements which he will adhere to make it clear that any project which is approved for federal aid must be correlated with the other highway work of the state. This precluded the consideration of plans for the use of the money on any but trunk line routes. To efficiently and effectively make use of the government money presented two problems. These were, first, how to do something which could not and would not otherwise be done and, second, how to prevent any counties from holding back on their road work and awaiting federal aid. To use the money in the poorer sections was the logical solution.

The amount apportioned to Michigan during the five-year period amounts to $2,186,755.80. Doubling this, it can be seen that approximately $4,250,000 will be spent in the state on federal aided roads. Assuming that such roads as the government will require to be built will cost on the average $10,000 per mile, over 400 miles of substantially built road should result.

As has already been mentioned, it is proposed to use the federal aid to build roads on the trunk line routes where gaps exist owing to the inability of some counties to stand the financial strain of road building. Properly located, 400 miles of federal aided roads will close up gaps which otherwise could not be filled for years to come and, with what roads will be constructed under the existing reward system, should insure the completion of Michigan's trunk line system by 1921.

The government money is available only by meeting it dollar for dollar. Therefore 50 per cent. of the cost must be paid by the state or its subdivisions. During the first nine years under the state reward system in Michigan, the state's share of the cost averaged 23.7 per cent. of the cost of all roads receiving state aid. On this basis, the state could afford to pay 25 per cent. of the cost and it should be entirely within the financial ability of the poorest counties to pay 25 per cent.

In order to arrive at an equitable basis upon which to distribute the cost of construction, the valuation per trunk line mile has been obtained by dividing the assessed valuation of each county by the trunk line mileage within its borders. The values for this unit vary through a wide range of from $25,233 to $16,320,156. Counties with an assessed valuation per trunk line mile of less than $100,000 are classed together; those from $100,000 to $200,000 are placed in a second class, and so on up to those of $500,000 or more. A schedule is proposed which would require the counties of the first class, which are the poorer counties, to pay 25 per cent. and the state 25 per cent. In each succeeding class the counties' share would be increased by 5 per cent. and that of the state decreased by 5 per cent. until those richer counties in the last class would be required to pay the full 50 per cent.

At a conference of the county road commissioners and good roads enthusiasts of the state recently held to discuss the plan outlined above, the only objection presented was that the counties in the richer and more thickly populated sections of the state were being forced to stretch their finances to build roads which will carry the traffic which comes to them.

Since the reward is doubled on trunk lines, the per cent. of cost paid by the state is also practically doubled, averaging 43.3 per cent. This is due to a large proportion of gravel and macadam roads on which the cost paid by the state is frequently greater than 50 per cent. On the higher types of roads such as concrete and brick, however, the proportion paid by the state is low, being about 15 per cent. It can readily be seen, therefore, that the federal aided roads, under such a distribution of costs as outlined will cost the state far less than under the reward system, since gravel and macadam surfaces will undoubtedly suffice for years in the poorer sections where the roads will be built.

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*Michigan State Highway Department.

If, as is expected, the proposed scheme is incorporated into legislation in substantially the same form, the state could well afford to increase the reward on bituminous concrete, cement concrete, and brick roads. By sharing in the building of the higher types of roads to more nearly the same extent that it does in building gravel and macadam roads, the state will materially aid the richer counties to cope with their road problems. Thus by the influx of the government money a well balanced program of state aid for road building in Michigan is made possible which will result in immediate and lasting benefit to the whole state.

Public Sentiment in Regard to Trunk Road Construction*

By **JOHN H. LEWIS**†

The construction of trunk roads has for years been opposed by many in the rural districts of Oregon. They demand first the construction of local roads which radiate from market centers.

The experience of the state in the expenditure of $25,000 on the Pacific Highway in the vicinity of Glendale indicates a sudden change of sentiment on the part of the rural population in this particular district. It is believed that the same reasons which caused this sudden change will ultimately bring about an overwhelming sentiment for the construction and maintenance of trunk lines through state and federal aid.

Glendale is a small town on the Southern Pacific Railway in Douglas County. In locating the Pacific Highway through this county the state's engineering department recommended the adoption of a short cut which would leave Glendale on a spur road, several miles off the through route. The citizens protested to the State Highway Commission, and the longer route was adopted, notwithstanding the fact that it would add greatly to the ultimate cost of the road, through having to pave four miles of unnecessary distance in addition to compelling all through traffic to go out of its way through Glendale.

About the time it was decided to build this longer route construction was started on a beet sugar factory at Grants Pass on the Southern Pacific Railway in the adjoining county to the south. A number of farmers on Cow Creek above the town of Glendale had contracted to grow sugar beets. They originally planned to haul by team to Glendale and ship by rail to the sugar factory. Later it developed that it would be more convenient and economical to haul by automobile trucks direct from the farm to the factory, and long petitions came from farmers in both counties demanding the construction of the short cut or trunk line, paralleling the railroad as opposed to the roads radiating from the railroad station.

The economic reason for this demand is the same which causes so much confusion respecting the relative merits of rail and water transportation.

We have recently learned that the cost of handling freight in cities, including terminal charges, is so great compared with the cost of hauling for short distances up to about 100 miles, that the transportation charge whether by rail or water, can practically be ignored.

While sufficient data are not available to justify so definite a statement respecting automobile truck and railway competition, yet judging from the radius that commercial houses in big cities of the East, where good roads are available, deliver to and receive goods from country customers, it is believed that it will be more economical and convenient to deliver by automobile truck direct from the producer in the country to consumer in the city within a radius of about 50 miles.

As there are few, if any, sections of the United States where important centers of population on railway lines are more than 50 miles apart, it is predicted that within a short time, only interurban railway corporations will be found opposing the construction of good roads paralleling railway lines. The loss in local business to transcontinental lines will be more than made up at the larger centers. The logical development is, therefore, trunk lines first, followed by the improvement of main county roads, or feeder lines.

Just as the railway is able to successfully compete with water transportation within certain limits, through greater convenience in receiving and delivering freight, so will the automobile truck be able to successfully compete with the railway within certain limits under favorable highway conditions. Highways will in the near future be built with as great care and skill as railroads. Bridges and pavements will be built to withstand certain maximum loadings prescribed by law. Horizontal or vertical curves too sharp to give a safe sight distance will be prohibited. Superelevation on curves will be provided for certain safe speeds. More consideration will also be given to standardizing the width of roads and the elimination of grade crossings. And those receiving special benefits will be compelled to pay license fees in proportion to the load carried.

Greater refinements in the location and construction of highways will be made as soon as the people realize the value in dollars and cents of saving in distance, rise and fall, or curvature. Many other refinements tending to promote economy and efficiency will be introduced as definite information on road economics is accumulated. Little progress can, however, be made until such time as the people come to recognize highway construction as a serious, complicated, technical business. The work must be organized along the lines of a railway corporation. There must be some plan devised whereby continuity in service of efficient employees can be provided, so that the public may profit by the experience of these men. The longer the service, the greater the efficiency, as a rule, where so much depends upon an intimate knowledge of local materials and conditions. Laboratory tests can not be depended upon in all cases.

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*Extract from a paper entitled, "Highways of the State of Oregon," presented at the tenth annual meeting of the Washington State Association of County Engineers, Tacoma, Wash.

†State Engineer of Oregon.

Road Transportation Costs in Texas*

By **B. K. COGHLAN**†

The cost of hauling one ton one mile on a poor road has been estimated at from 30 to 45 cts., and in some cases as high as 65 cts. or more. During the winter of 1914-15 farmers in one county in this state allowed the cotton buyer two dollars a bale for hauling cotton to the railroad station, the length of haul averaging less than five miles; in another county, cotton ginned in October was not marketed until March, although several dollars a bale was offered to freighters to haul it, while 40 to 50 cts. a ton per mile is not an unusual price for hauling in the rice districts.

With the exception of the Panhandle and some of the southwestern counties, a farmer living in this state on a poor road five miles from market can not expect to average more than two round trips a day to town, nor to carry more than three bales of cotton to the load. His day's work is then equivalent to hauling ¾ of a ton 10 miles, or one ton 7½ miles; at $3 a day for man and team this represents a cost of 40 cts. a ton mile. In some of the western counties, where climatic conditions are more favorable and where the natural condition of the roads is better, the amount of the load or the length of the haul might be somewhat increased; on long hauls an economy would be realized by increasing the load and using two or more teams to the wagon; but even then, where traffic must make use of poorly located, poorly drained and poorly surfaced highways, the cost of hauling will rarely be under 30 cts. per ton mile. It can then be stated that the average cost of hauling on the poor roads of the state (and at least 90 per cent. of our roads are poor) is in the neighborhood of 35 cts. per ton mile. It should be noted that this estimate does not cover the cost of broken harness, broken wagons and injured animals due to using bad roads.

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*From "The Financial Side of Road Improvement," Bulletin 13, Texas Engineering Experiment Station, Agricultural and Mechanical College of Texas.

†Associate Professor of Highway Engineering, Agricultural and Mechanical College of Texas.

A good road has been defined as one that can be traveled with comfort and safety three hundred and sixty-five days in the year; and it should be the aim of every community in the state to get the principal market roads at least to conform approximately to this standard. It can be seen at once that this definition does not mention any one type of road as a standard by which all other types shall be measured, but leaves this point to be settled by local conditions in each individual case. In some parts of the state a well graded earth road, well located and well drained, will fulfill all requirements; in a few counties a sand-clay road will be satisfactory; in a large portion of the state gravel roads are the logical choice; while shell, macadam, bituminous macadam, bituminous concrete, brick and concrete roads all have their proper place in highway economics.

A team that can haul three bales of cotton through sand and mud can haul from six to twelve bales on a good road, depending on the character of the surface, and can do it with less effort and in less time. Yet if this be true (and it is true, as many communities in Texas can testify) the cost of hauling, as shown in a preceding paragraph, has been reduced by from 50 to 75 per cent. In sections of the state where a well graded earth road is a good road the year around, hauling, by contract, rarely costs over 20 cts. per ton mile, or 1 ct. a mile per 100 pounds; in other sections hauling on well maintained gravel roads ranges from 12 to 15 cts. per ton mile, depending on the amount of hauling to be done and the variation in the length of the haul; while the cost of hauling on the more expensive types of pavement, such as bituminous concrete or concrete, is governed in most cases by the safe load for the wagon and not by the amount that the team can pull.

Recent Papers on Street Work

Abstracts of Some of the Important Papers Presented at the Newark Meeting of the American Society of Municipal Improvements

Maintenance; and Its Importance in Selecting Pavements

By C. D. POLLOCK*

Very few cities, counties or states give any real consideration to maintenance cost in deciding upon the kinds of pavements to be laid. Many cities have appropriations for repairs, and, while these appropriations are always used, reports do not show whether the streets are kept in good repair or whether the money was spent in fixing as many holes as possible, leaving the rest of the work to be done with another year's funds. Unless these facts are known it is impossible to arrive at any correct conclusions from a comparison of maintenance costs.

Many of our cities have experienced engineers to draw specifications for pavements and to supervise their construction. They get good pavements of their kind, but the authorities think that the work of the engineer is done when this has been accomplished. In other words the prevailing idea seems to be that when a pavement is laid the engineer is through and any politician with a good following can do the rest. As a result the maintenance work and replacing of pavements over cuts are often done under a man designated as superintendent of streets, or bearing some other title, whose only qualification is that he was a good worker in the last campaign. He may do his best, or he may only see that a maximum number of voters are employed. He will probably keep records of the cost of repairs by weeks, months or years, but will have no idea of keeping costs by streets, blocks or contracts. As a result his costs will mean nothing except that he has had an appropriation and has spent it where he thinks it will do the most good at the next election. This gives the engineer who laid the pavement no knowledge as to its real cost, and consequently no information as to whether or not he should continue to lay the same kinds of pavements under similar conditions.

The foregoing seems to be the rule rather than the exception in this country and it applies not only to municipalities but also to counties and states. Some state highway reports furnish a great amount of data to illustrate this point, but the work is so divided and the reports are from so many officials that without a large amount of labor nothing can be learned.

By the expenditure of considerable time in the study of various sections of the reports of a neighboring state where water bound macadam is the pavement most frequently laid, even upon main roads, it was found that the first cost and the repair cost during a period of six years amounted to considerably more than the sum that would have been required to lay a pavement of the same width of granite block on a concrete foundation and make the additional provisions for a sinking fund. This search could be carried further to include many more roads where a cheaper form of pavement, yet a more substantial one than water bound macadam could be used with much economy from the standpoint of maintenance.

The remedy for this condition is to employ an experienced paving engineer on the original work and then continue the same engineer in charge of maintenance. When this is done the engineer will watch the pavement carefully. He will also watch the maintenance costs, and will know when he requires a more substantial pavement under certain traffic conditions and also when he has the proper pavement for those conditions. In other words he will keep careful records of the maintenance costs of the various pavements together with traffic records on each and will be in a position to draw conclusions as to when and where various pavements should be used. Under the present state of divided responsibility prevailing in many of our cities, this would be impossible.

The all-important point is to place both new work and maintenance under one engineering head and then hold him responsible for results.

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*Pollock & Taber, Consulting Engineers, New York, N. Y.

The Repaving of Broad Street, Elizabeth, New Jersey, with Grouted Granite Block[*]

By THOMAS E. COLLINS[†]

In the paving of Broad Street it was necessary to provide for continuous traffic and to do this only one side of the street was paved at a time.

In order to reduce the cost of the pavement it was provided in the specifications that the contractors should place a value on the old blocks. With this item deducted the city was enabled to secure a bid of $2.97 per sq. yd. This included the removal of the old blocks, the excavation of the subgrade to a depth of about 8 ins., the thorough compacting of the subgrade, the placing of a 6-in. concrete foundation and a 1¼-in. sand cushion, and the laying and grouting of the blocks.

The contractor removed the old blocks and had them crushed at a plant about a quarter of a mile from the job. After removing the dust and all stones over 2 ins. in size, the material obtained from the old blocks was used in the concrete.

The subsoil was found to be in good condition and to be well drained and no special tamping was required except where openings had been made. After compacting the subgrade with a 10-ton roller, a 1:3:6 concrete foundation was laid to a depth of 6 ins. and was allowed to set for 7 days before the placing of the blocks. During setting it was protected by a thin coat of sand which was sprinkled two or three times a day.

The blocks were laid on the sand cushion with joints not exceeding ½ in. in width. The joints were then filled with enough pea stone to properly wedge the blocks. After this, the blocks were rammed to a firm bearing, one rammer-man being used for every three pavers. Especial care was taken to have all joints fully open to a depth of not less than 4 ins. from the top of the pavement. The filler consisted of a 1:1 cement-sand grout, two applications being made. The pavement was thoroughly wet before the first grouting, and the first application of grout was also sprinkled immediately before making the second application. Part of the work was done in 1915 and on this a hand-mixed grout was used. The grouting done in 1916 was all machine work. After the second pouring of grout, the surplus grout was removed from the blocks by means of a rubber squeegee.

Problems and Methods in Snow Removal and Disposal

By H. S. RICHARDS[‡]

Among the most exacting duties of park officials is maintaining walks and drives in good condition for travel at all times, even during or after a severe snowstorm. In a park and boulevard system like that of the South Parks of Chicago, where there are boulevards through the downtown business districts as well as through residence districts, problems quite difficult to solve are met.

In this work it is necessary to open paths immediately to facilitate traffic, to prevent the packing of the snow with a resulting increased cost of removal, to protect the pavement from the wear caused by traffic following ruts worn in packed snow, and to prevent the formation of a dangerous icy coating. It is also necessary to actually remove or dispose of the snow in the downtown sections as soon as possible after the paths have been opened.

The first means used for cleaning the walks and opening paths on the drives were horse-drawn plows. Both one- and two-horse plows are used, a "V" shaped plow for one horse and a small road grader for a team.

The removal of snow from the drives has proved more difficult. The four-wheeled road grader with adjustable blade is the type of horse-drawn plow which has given the most satisfactory service. On most of the boulevards and in the larger parks these are used in groups of four to six lined up diagonally across half the pavement.

At present there are 45 miles of drives in the South Park system from which snow is cleaned in winter, and to cover this with horse-drawn plows in a reasonable time would require more horses and plows than are available. While horse-drawn plows are in operation snow is being densely compacted by traffic, with the result that these plows remove little more than the loose snow on top. Ruts are formed in the packed snow and the traffic following these ruts results in wear which necessitates costly repairs.

As soon as motor trucks became practical they were tried, but none was found that would clean the snow as desired. One of the chief difficulties was the lack of traction when working in piled up snow. In the winter of 1914-15 observations were made of the operation of a snow plow consisting of a 3-wheeled gasoline tractor fitted at the front with a "V" shaped plow or moldboard and with a large revolving street broom attached behind the tractor. Three of these were ordered for the winter of 1915-16 and were used principally in the downtown district.

After some experimenting it was decided that the best plan to follow in the downtown district was to remove the snow as it fell, and arrangements were made for putting two of the tractors with brooms and a third equipped with both the broom and the plow into operation shortly after the beginning of the snow-fall and keeping them at work until the storm was over. The two tractors with brooms are used first, the third tractor with the broom and plow following and removing the ridge of snow swept aside by the two tractors preceding. The snow is cleaned from the center to the sides of the roadway, the machines traveling with the traffic at rates up to 10 miles an hour. When the machines finish this work the brooms are removed, the plow attachments put on and the tractors sent out to assist the horse-drawn plows in cleaning the remaining park and boulevard drives, the tractors being used first on the busier streets.

These outfits have been tried out on light, dry snow, heavy, wet snow, slippery or icy snow and snow packed by traffic, and have given first-rate service under all these conditions. At a speed of from 9 to 10 miles an hour with sweeper attachments good results can be secured with the revolving brooms in places where horse-drawn sweepers do not operate properly because they do not travel fast enough to prevent the brooms becoming clogged with snow. With the three tractor outfits it has been possible to keep a section of a downtown drive 1⅛ miles long practically clean and open to traffic during snows when the rate of fall did not exceed 1 in. per hour. It is planned to add to the motor cleaning equipment each year, gradually replacing horse-drawn plows.

The cost of the work with the tractors has been considerably less than that done by horse-drawn machines. The tractor outfits are especially valuable for breaking up packed snow and ice. After one storm last winter considerable slush was frozen on a section of drive where it had been impossible to finish the cleaning. Laborers using picks loosened only enough to keep one team busy hauling it away. A tractor pulling a road grader worked well in this material and in an hour loosened up enough to keep seven teams busy for four hours.

The tractors are used for hauling wagons loaded with snow to the dump as well as for plowing and sweeping. One of the tractors handles an especially large wagon holding 14 cu. yds.

During last winter a device for facilitating the disposal of snow through the sewers was tried out. The device consisted of a water turbine armed with three free blades and mounted in a wire cage or basket of such a size as to permit it to set in a sewer manhole. The water turbine was connected with a fire hydrant, the water after revolving the turbine flowing through the wire basket into the sewer. Snow was shoveled into the basket, where the three blades mixed it with water. Under a pressure of 15 to 25 lbs. the machine disposed of all the snow that two men could shovel into the basket. With a higher pressure it could have taken care of twice as much.

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[*] Abstract of part of paper.

[†] City Engineer, Elizabeth, N. J.

[‡] Superintendent of Maintenance and Repair, South Park Commissioners, Chicago, Ill.

Granulated rock salt has been used to some extent for removing snow. There have been some complaints of this practice, however, because the salt melts the ice and snow and forms puddles from which water is splashed upon automobile bodies, upon which it leaves white spots after drying.

The Fundamental Necessities in the Maintenance and Upkeep of Streets and Roads

By WILL P. BLAIR*

The whole problem of streets should be managed in the same way as is any modern business having as its ultimate object progress or profit.

There is no objection to the careful watching of all expenditures by the means provided in various published methods of cost accounting. But it is not enough in these days to know that the price paid for a thing is a certain amount of money. An executor or administrator not only has to account for the amount expended, but also for what is obtained and why it is purchased. It serves no useful purpose merely to know that money has been expended; there should also be knowledge of what it has been expended for.

But consider the case of a pavement. Who certifies as to its quality? Who records its identification? Who is even held responsible for its existence? And where are there official records showing that every detail of the specifications under which it is built have been complied with?

When a purchase is made in private business a competent man is called upon to report whether the purchase meets the requirements of the purchaser and is value received for the purchase price. In the case of a street or road the value is passed upon, in ninety-nine cases out of a hundred, by an agency the least competent to judge and in a manner incapable of producing good results. Often the inspection is made by a pensioner acting as an inspector. Sometimes the procedure is worse—there is a blind inspection by a dignified city council, or a committee of that body, made after the street is completed and there is no way of seeing defects that should have been known before.

A street is subject to everyday use as much as is a machine in a manufacturing establishment or a vehicle that travels over the street. State highway departments, educational institutions, and the Office of Public Roads and Rural Engineering have deemed it advisable to construct various types of roads by various methods and with various materials with a view to studying them and keeping records of behavior, costs, traffic and the like. The conclusions reached after years of study are of doubtful character at best and are obtained from conditions differing widely from those actually existing on the streets. Why build a road for study? Why not instead study the roads built for use?

Counting the traffic passing over a street of any particular kind is no basis upon which to draw conclusions of any kind unless the traffic is considered together with a knowledge of exactly what it passes over. Why can not information of this kind be obtained in a more practical and scientific way so that it will be more reliable and will more nearly meet the necessities of the case?

There is no plan of street and road management or street administration that can be called fundamentally efficient, because there exists no plan of management that includes a certified copy of construction, maintenance and repair data, cost data, or any of the information sought in the building of so-called experimental roads. Streets that are improved are of various types. They are in various states of repair, and they are in various locations. A single street carries a variety of traffic and different sections of it carry different traffic. Different streets are built on different soils. Some are susceptible of easy natural drainage, and others must be drained artificially. Streets are generally built with the plans, specifications and the contract in the office of the contractor and under the direction of a foreman who has never seen either the plans or the specifications.

The type of improvement is determined to a greater or less extent by whims, by cheapness, by the influence of promoters—in almost every case from considerations other than those upon which good judgment depends. The streets when built evidence simply a lavish expenditure of money. But few of the streets and roads have legal names, most of them bearing only nicknames. There is no record of the original investment. The cost of upkeep is so confused with general charges against the whole pavement that there is obainable no knowledge whatever as to the amount expended for it. There is nothing to show whether expenditures made for repairs are necessitated by wear and tear; by defects in the original construction; by accidents, or by cuts or openings. There is nothing to show whether a street has remained out of repair when repair was needed. This chaotic and inexcusable mismanagement has been allowed because the earning capacity of streets and roads has not been taken into account. Similar methods in a commercial establishment would lead to bankruptcy.

During the past twenty years streets have been improved practically without supervision—without accountability for results. No two contractors building the same kind of streets have built in the same way; each has followed his individual methods. The result is that ninety-nine per cent. of the defects found in streets are not due to ordinary wear and tear but to something else.

There must be established a business system that is fundamental, that will bear upon everything making for the economical expenditure of funds. Separate the streets into certain divisions and these divisions into sections not exceeding a mile in length. These sections must be measured, numbered and recorded for the purpose of complete identification. Put these divisions in charge of a competent engineer. When this is done a particular section can be treated as a thing, as a piece, as a machine, and it will be possible to record its efficiency, watch its weakness or its strength, its value and its behavior, and record information of every kind. Similar data can be secured from every street within the corporate limits of the city, and with these data in hand the adaptability of various types of streets for varied kinds of service will in a short time become apparent.

By such a plan of road and street management the greatest economy could be secured, and in addition there would be the benefit of the information available for future work. Street and road improvement, maintenance and repair would at once become a scientific, systematic, business-like operation and wasted millions would be saved.

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*Secretary, National Paving Brick Manufacturers' Association.

A Granite Block Pavement of 4-in. Blocks has been laid in Brooklyn, N. Y. It is on a portion of Bedford Ave. and is said to be the first of the kind laid in New York City with the exception of a short section in the experimental pavement laid some time ago on Second Ave. in Manhattan Borough. The specifications called for blocks from 7 to 11 ins. long, from 3¾ to 4¼ ins. wide and from 3¾ to 4¼ ins. deep. They were laid with ⅝-in. joints on a ¾-in. bed of a 1:4 mixture of Portland cement and sand. The foundation is of 1:3:5 concrete and the joints between the blocks are filled with a 1:1 cement grout.

COMING MEETINGS

November 16-17—Washington State Good Roads Association—Annual convention, Centralia, Wash. Secretary, John R. Rea, Tacoma, Wash.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

PUBLICATIONS

"ROAD MATERIAL SURVEYS IN 1914," by L. Reinecke, Canada Department of Mines, Geological Survey, Memoir 85, No. 71 Geological Series. Paper, 6½x9¾ ins., vii. + 244 pp.

This report is divided into five parts, the first consisting of a brief treatise on roads with special reference to the materials used in their construction. Part II. is a description of the deposits of diabase along the north shore of Lake Huron; Part III. describes the road materials occurring in Essex County; Part IV., road materials in Kent County, and Part V, the road materials occurring along the north shore of Lake Ontario between Port Hope and Hamilton. Considerable space is given to tabulated statements showing the occurrence of various materials in the areas covered by the report. The illustrations consist of 10 plates carrying reproductions of photographs of road material deposits. Four maps on which are indicated road materials in the various areas included, and one showing transportation lines in southern Ontario, accompany the report.

"THE FINANCIAL SIDE OF ROAD IMPROVEMENT," by B. K. Coghlan, Assistant Professor of Highway Engineering, Agricultural and Mechanical College of Texas. Bulletin 13, Texas Engineering Experiment Station, Agricultural and Mechanical College of Texas; Third Series, Vol. 2, No. 8. Paper, 6x9 ins., 24 pp.; illustrated.

The contents of this publication comprise a discussion of the financing of road improvement considered under the following heads: 1. What financial benefit is derived from a good road? 2. What do good roads cost? 3. How can money for road improvement be obtained? 4. When is a community justified in spending money for road improvement? 5. How can communities in Texas get better results in the future than they have in the past for the money expended in road construction and improvement? The illustrations consist of full page half-tone reproductions of photographs showing improved and unimproved roads, the effect of badly constructed roads and bridges, and a bridge on the improved highway system of Tarrant County, Texas.

PERSONAL NOTES

Hollie Ford has been made County Road Engineer of Graves County, Kentucky.

John R. Thompson has been reappointed County Road Engineer of McCracken County, Kentucky.

M. H. Mooney has been appointed County Engineer of Grundy County, Missouri, vice W. E. Ralls, resigned.

J. M. Flannigan has been appointed County Road Engineer of Hopkins County, Kentucky, to succeed I. B. Earle.

E. W. Dahl, formerly with the U. S. Reclamation Service, has been appointed County Engineer of Yuma County, Ariz.

W. B. Crawley has been appointed Superintendent of Roads of Houston County, Alabama, to succeed the late W. E. McEachern.

James Sheppard, of Queenston, Ont., Superintendent of the Welland County road system, was killed by a railroad train at Brookfield recently.

Harry Bowers has resigned as County Road Engineer of Ohio County, West Virginia, to become General Superintendent of the Ball Engineering Co. of Wheeling.

C. R. Thomas, of Wilmington, N. C., has been appointed Division Engineer of the Kentucky Department of Public Roads to succeed O. S. Canning, resigned.

L. G. Burrell has resigned as Assistant Engineer of the Farris Bridge Co., of Charleston, W. Va., to become Bridge Engineer of Wyoming County, West Virginia.

Clark R. Mandigo has resigned as Assistant City Engineer of Kansas City, Mo., to become a member of the engineering staff of the Portland Cement Association. Mr. Mandigo has been Assistant City Engineer of Kansas City since 1911.

R. R. Clark, a structural engineer of Portland, Ore., has been employed by the Oregon State Highway Department to supervise the erection of steel on all bridge work under the supervision of the department.

E. Herbert Dunmire, Assoc. M. Am. Soc. C. E., City Engineer of Lawrence, Kan., has been made Superintendent of the city water works. Mr. Dunmire's appointment is the result of the combination of the two offices.

A. L. Luedke has resigned as Assistant Division Engineer of the Wisconsin State Highway Department to become Engineer-Accountant in the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

W. S. Lindsay, County Commissioner of Clarke County, Washington, has been appointed by the Interstate Bridge Commission to act temporarily as General Superintendent of the bridge crossing the Columbia River between Vancouver and Portland.

L. W. Rundlett, of St. Paul, Minn., formerly City Engineer of that city and later Commissioner of Public Works of Moose Jaw, Canada, died recently. Mr. Rundlett was a director of the American Society of Civil Engineers and was connected with the St. Paul City Engineering Department for about twenty-five years previous to 1911.

A. E. Loder has resigned as Division Engineer of the California State Highway Commission to become Assistant Chief Engineer of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. In his new position Mr. Loder will have charge of road construction in the national forests under the recent law providing for federal aid in that work. Before his connection with the California State Highway Department Mr. Loder was Chief Engineer of the Los Angeles County (Cal.) Highway Commission.

EQUIPMENT — TRADE — MATERIALS

Automobile Crane Adapted to Street Work

A machine adapted to a variety of uses, including road and street work, is shown in the accompanying illustration. The machine is known as an "auto-crane" and is described by the manufacturers as "a cross between a locomotive crane and a motor truck."

The illustration shows a Model "B" machine which is similar in its general features, but somewhat less powerful than the Model "C" outfit which is described in the following paragraphs. The new model, according to the manufacturers, develops about 50 per cent. more power and speed, has an improved boiler, an improved differential, a cab and a number of minor improvements.

The machine consists essentially of a heavy frame supported on four wheels and carrying a power plant, a derrick and the necesary mechanism for propelling the outfit and for operating the derrick. The frame is built of heavy steel channels strongly braced. The length of the body of the machine is 7 ft. 10 ins., and its width 6 ft. 6 ins. The width, out to out of wheels, is 9 ft. 6 ins. and the height from the ground to the top of the A-frame sheave is 12 ft. Outriggers which can be folded out of the way when not in use extend from the sides of the machine at the A-frame, their width from out to out being 19 ft. Their bearing is adjusted by screw jacks attached to the ends.

The driving wheels, which are at the derrick end of the machine, are of steel, 38 ins. in diameter, with tires having 10-in. faces. The front wheels are of similar construction, 30 ins. in diameter, also with 10-in. faces. The front and rear wheels track. The machine is driven by chains running from sprockets on the jack shaft to sprockets on the driving axle. The steering wheels are mounted on a fifth wheel and are operated by a hand wheel through a worm and worm gear. The power plant regularly supplied consists of a 15 HP. vertical tubular boiler, 36 ins. in diameter and 72 ins. high, and twin vertical marine type engines of 25 HP., by brake test at 100 lbs. of steam. The boiler is furnished to comply with local ordinances, when so specified, but is regularly furnished to comply with the Ohio inspection laws. Either a 25-HP. electric motor or a 25-HP. gasoline engine is supplied when specially ordered.

The derrick boom is made of 8x10-in. yellow pine or Oregon fir and is regularly supplied 28 ft. long. Greater lengths are furnished when specially ordered. The 28-ft. boom operated at a 45-degree elevation has a working radius of 20 ft. and a clearance between the bucket and the ground of 15 ft. Raising the bucket to clear the ground by 18 ft. gives a working radius of 16 ft. The manufacturers recommend that the working radius be kept within 20 ft.

The machine can be operated by one man, the steering wheel and all operating levers being within easy reach. An all-steel cab is furnished to protect the operator and the machinery. The roof of the cab is of heavy corrugated iron and is carried on a steel frame. Canvas drop curtains enclosing all four sides are furnished.

The machine uses a ½-yd. bucket and weighs, without the bucket, 10 tons. The capacity of the derrick is 4,000 lbs. at an 18-ft. working radius. The speed forward or reverse is 200 ft. per minute.

The machine is known as the "Byers Auto-Crane," and is manufactured by the John F. Byers Machine Co., of Ravenna, Ohio.

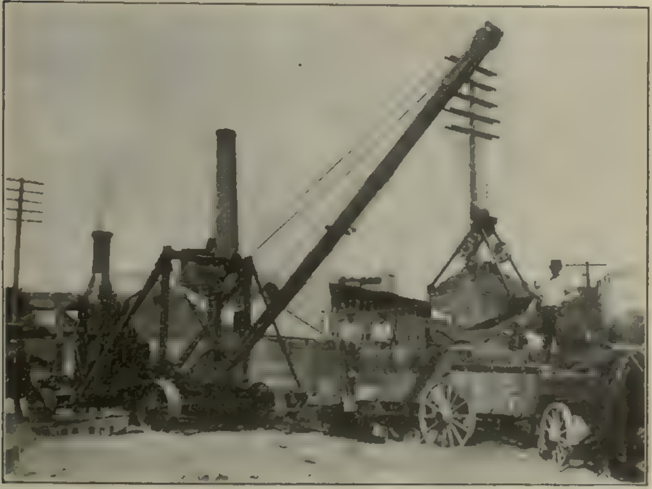
Hauling Equipment Used on an Iowa Road Job

A novel method of transporting road material was used on a recent road job near Sioux City. The outfit consisted of a narrow gauge industrial railway track and 24 Koppel side-dump cars with a Jeffrey "Quad" as motive power.

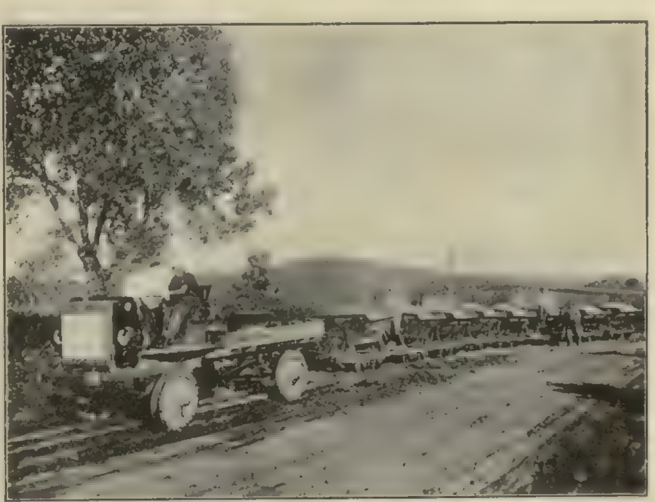
The work done comprised the construction of 4¾ miles of concrete pavement on the Broken Kettle Road leading into Sioux City. The road has few tangents or level sections, the grades running to a maximum of a little over 6 per cent. The railway was used for hauling concrete materials from the hoppers to the mixer. The outfit was used for about six weeks for from 12 to 14 hours a day including Sundays, the total distance covered by the tractor being something over 1,500 miles.

The ordinary train consisted of from 8 to 12 cars, part of the cars being loaded at the hopper while the rest were on the way to the work. In hauling the cars the tractor ran with the wheels on one side against one of the rails while the opposite pair ran alongside in the soft earth.

The work was done by Hanlon & Okes of Minneapolis, Minn., and Sioux City, Ia.



BYERS "AUTO-CRANE" UNLOADING BANK GRAVEL FROM CARS AT FLINT, MICH.



JEFFERY "QUAD" AND KOPPEL CARS IN USE ON A ROAD JOB NEAR SIOUX CITY, IA.

Prizes Offered for Photographs of Concrete Construction

A photographic prize competition, open to any one not an employee of the Portland Cement Association, has been announced by that organization.

The object of the competition is to secure photographs showing the use of concrete in roads and streets, bridges, buildings and other forms of construction. Photographs from 3¼ by 4¼ ins. up may be submitted, and any number of prints may be entered by a contestant. Each print must be made on glossy paper, for better reproduction, and must be sent unmounted and properly protected. Each print must have written on the back the name and address of the person submitting it, information as to whether the original negative is in existence and if so where, and a brief description of the subject, including its location, the name and address of the owner, builder or contractor, or similar information that will enable the association to verify the fact that the work is of concrete.

The prizes will consist of a first prize of $25, a second prize of $10, and three additional prizes of $5 each. In addition, all pictures having a distinct value for use in advertising literature will be purchased. The contest will close December 31, 1916, unless extended to a later date. Detailed information may be obtained from the Photographic Contest Committee, Portland Cement Association, 111 West Washington St., Chicago, Ill.

Patents on Colloidal Bitumens

There have recently been issued to Clifford Richardson United States patents on an improved bituminous substance and the process of its manufacture. Similar patents have also been granted in Canada, Great Britain, France and Italy.

These are believed to be the first patents covering a product and process involving the introduction of colloidal matter into all types of bitumens. The process is described as consisting of "the introduction of clay in the form of a collodial aqueous paste and combining this paste with the bitumen in such a way that when the water is subsequently driven off the bitumen forms the continuous phase of the collodial material." According to the inventor, there is obtained "an increased degree of body or stability in these bituminous substances, by means of the addition to and intimate and uniform dispersion through the bituminous substance of a proper proportion of a substance in the state of a disperse colloid."

The materials produced by this method of incorporating clay in a collodial form with bitumen are said to have properties differing in a marked degree from those of products in which the mineral matter has been introduced in the form of a dry powder. The products made by the Richardson method vary from materials resembling vulcanized rubber to plastic but stable mixtures for paving and other purposes.

TRADE NOTES

Two additional concerns have been added to the list of licensees of the Dunn Wire-Cut Lug Brick Co., Conneaut, O. They are the Streator Clay Manufacturing Co., Streator, Ill., and the Martinsville Brick Co., Martinsville, Ind. The former has recently completed a new plant with a daily capacity of 60,000 paving block. The capacity of the Martinsville plant is 30,000 block a day.

Assistance to rural contractors specializing in concrete work, or others desiring to undertake such work, is to be given by the Portland Cement Association, 111 West Washington St., Chicago, Ill., under a plan which has recently been devised by the association's Extension Division. The details of the plan include various means of cooperating with concrete contractors for the purpose of increasing their business and making possible better work. The work of the association will be done under the supervision of the Director of the Extension Division.

NEWS NOTES

Over 1,500,000 sq. yds. of Vertical Fiber Brick Pavement has been contracted for during the 1916 season by the plants of the Western Paving Brick Manufacturers' Association to cities in the Middle West, according to a recent report. The blocks are made in depths ranging from 2½ to 4 ins., but most of the shipments made this year have consisted of 3-in. blocks.

A Canadian Transcontinental Highway was proposed by the Military Hospitals Commission at a recent meeting at Toronto, Ontario. Resolutions calling for the building of the road—which were to be forwarded to the government—called attention to the value of such an undertaking in furnishing employment for thousands of unskilled men and ex-soldiers who will be unable to find work immediately after the close of the war.

Flangeways in the Concrete Next to the Rails of the car tracks crossing the Interstate Bridge near Portland, Ore., were formed by means of a novel machine. The bridge is paved with asphaltic concrete with Portland cement concrete headers at the rails. Cast iron rollers of the requisite shape were mounted at one end of a small car which was run back and forth on the tracks until the flangeways had been completed.

The Elimination of Contract Work on Public Improvements in Los Angeles, Cal., is proposed by a civic organization known as the United Improvement Federation. It is proposed to accomplish this end by amending the city charter in such a way as to make it unlawful to call for bids on street, sewer and other municipal works. The federation proposes, instead, to have such work performed at actual cost by a municipal department created and operated for that purpose.

The Loads and Speeds of Motor Trucks are Limited by City Ordinance in Cleveland, Ohio. A motor truck, which, with its load, weighs more than 3 and less than 8 tons, must not exceed 12 miles per hour, and a truck weighing, with load, over 8 tons must not exceed 8 miles per hour. No load greater than 12 tons may be driven over the city streets except by permit issued by the Director of Public Service in which are specified the streets over which the load may be carried. In addition, any vehicle weighing over 6 tons, loaded, must carry signs stating its weight and maximum carrying capacity. More than 12 tons may be hauled in a tractor and trailer train, "provided, however, that the number of vehicles in such trains shall not be greater than is suffcient to haul three separate loads and that the wegiht of each load, excluding the vehicle, shall not exceed 12 tons."

Resurfacing a Concrete Pavement with Reinforced Concrete has been tried in Wayne County, Mich., according to a recent report. The old pavement was laid six years ago on a road which has since been called upon to bear an increasingly heavy traffic. It was a 2-course pavement, the lower course consisting of 4 ins. of 1:2½:5 concrete with limestone coarse aggregate, and the top course consisting of 2½ ins. of 1:2:3 concrete with crushed fieldstone aggregate. It was 16 ft. wide and was put down in 25-ft. sections separated by expansion joints of ¼-in. tar paper. The resurfacing work included also the widening of the pavement to 20 ft. This was accomplished by breaking off the rounded edge of the old pavement on each side and adding enough 1:2:4 concrete, 6 ins. thick, to make the desired width. The surface of the pavement was then cleaned and all the bituminous material in cracks and on the surface removed. Water was then sprinkled over it, after which there was spread a very thin layer of a mixture of Tarvia A and Tarvia X. Over this was laid the new surfacing, consisting of 3 ins. of 1:1½:2½ concrete, reinforced with triangular-mesh wire, No. 26. Expansion joints of armor plates and felt were placed in the surface course exactly coinciding with those in the old pavement.

GOOD ROADS

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NEW YORK, NOVEMBER 11, 1916

Number
20

Annual Meeting and Election of Officers American Road Builders' Association

The annual meeting of the American Road Builders' Association was held on Friday, November 3, at the Automobile Club of America, New York, N. Y., and was preceded by a meeting of the Board of Directors. The meeting was called to order by Col. E. A. Stevens, State Commissioner of Public Roads of New Jersey, President of the association.

Reports presented by the Secretary showed the organization to be in a flourishing condition. The report of the Executive Committee outlined plans for the annual convention of the association, which will be held in Boston, Mass., during the week beginning February 5, 1917. The Eighth National Good Roads Show will be held in conjunction with the convention and, according to the committee's report, promises to be the most successful affair of its kind ever undertaken by the association.

The meeting was followed by the annual "get-together" dinner of the organization, which was held in the grill room of the Automobile Club of America and was attended by upward of 100 members and guests. The result of the ballot for officers, which had been conducted by mail, was announced at the dinner as follows:

President, Arthur W. Dean, Chief Engineer, Massachusetts State Highway Commission; First Vice-President, William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa.; Second Vice-President, Austin B. Fletcher, State Highway Engineer of California; Third Vice-President, Arthur H. Blanchard, Professor of Highway Engineering, Columbia University, New York; Secretary, E. L. Powers, Editor of "Good Roads"; Treasurer, W. W. Crosby, Consulting Engineer, Baltimore, Md.; Directors for three years, T. R. Agg, Professor of Highway Engineering, Iowa State College, Ames, Ia.; W. E. Atkinson, State Highway Engineer of Louisiana; Fred E. Ellis, Manager, Essex Trap Rock & Construction Co., Peabody, Mass.; R. H. Gillespie, Chief Engineer of Sewers and Highways, Borough of the Bronx, New York City; B. Michaud, Deputy Minister, Department of Roads, Province of Quebec, Canada; Paul D. Sargent, Chief Engineer, Maine State Highway Commission.

Col. E. A. Stevens, State Commissioner of Public Roads of New Jersey, the retiring president of the association, acted as toastmaster. One of the speakers was Edwin Duffey, Commissioner of Highways of the State of New York.

Commissioner Duffey spoke on the matter of federal aid for highway construction, with especial reference to the State of New York. He said that, as the legislature was not in session at the time the federal aid bill was passed, no provision had been made for meeting the requirements of the bill. In his opinion, existing highway funds could not be used to meet the federal appropriation, inasmuch as the uses of such funds were specifically provided for in the laws governing the bond issue by which the funds were raised.

He believed, however, that means would be provided to meet, from other sources, the allotment of federal funds to which the state was entitled, in round figures about $4,000,000. In this manner the state would have an extra fund of approximately $8,000,000 which, he believed, should be used to complete gaps in the state highway system and to build important roads which were not provided for from the existing funds.

Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York City, spoke on the growing congestion of traffic due to the increasing width and capacity of motor vehicles. An abstract of his speech follows:

Among the most difficult problems presented to road builders and road planners is that of street traffic. The increase in the volume of this traffic has been almost sensational during recent years, especially since the use of the motor vehicle became general. While this increase is quite obvious in all cities, the statistics of street traffic in London are unusually complete and the reports of the London Traffic Branch of the Board of Trade bring out some remarkable facts. The number of horse-drawn cabs licensed by the Metropolitan Police decreased from 11,404 in 1903 to 2,385 in 1912, while during the same period the number of motor cabs increased from one to 7,969. During the same period the motor omnibuses increased from 13 to 2,908, while the 3,623 horse-drawn omnibuses in 1903 have entirely disappeared. Some remarkable statistics are given as to the number of vehicles passing certain points at certain hours and during the day, but the surprising feature of these statistics is that the total number of vehicles licensed in 1912, including tramway cars, was actually 203 less than in 1903. No better illustration is afforded of the enormous increase in the service rendered by motor vehicles owing to their higher speed and greater flexibility.

On certain streets of all busy cities the number of vehicles is so great and the resulting congestion is so serious, that students of this problem have become much alarmed and are discussing the need of more effective traffic regulation. The easiest solution of this problem appears, however, to be the better diffusion or distribution of traffic and this can in no way be more effectively brought about than by a better and more uniform standard of improvement of the roadways of both urban and rural highways.

Why is it that so many drivers of vehicles tend to use the same street when many different possible routes could be followed? Undoubtedly the chief reason is that they wish to use the streets that are best paved. In the case of the motor vehicle, a slight detour with corresponding increase of distance, is of little consequence and time will actually be saved by the avoidance of traffic congestion, but those who are riding, especially for pleasure, prefer to follow the streets that are most attractive, those on which the abutting property has been improved to a higher degree and in a little more sightly manner. When our streets shall have become uniformly well paved, and when the property along them shall have been improved according to better standard, not necessarily with palatial homes, but with good taste, when tree planting is taken up more seriously and when the space not needed for roadways and foot paths is devoted to grass plots or planted with shrubbery, those with whom time is not the most important element, will follow these streets now given over wholly to the delivery wagons of the milkman, the grocer and the butcher, and appreciable progress will have been made in the solution of the traffic problem. There is, however, a very serious problem which has grown out of the use of motor vehicles, namely the increasing weight, the increasing wheel loads and the increasing size of these vehicles. The motor of the tractor can overcome grades with heavy loads which were impossible to the horse-drawn vehicle, and highway officials responsible for the maintenance of our city streets and of the country highways leading out of them, are greatly concerned at the damage inflicted upon road surfaces by these loads. The only effective remedy appears to be the enactment of drastic ordinances and laws which will absolutely prohibit the use of vehicles having more than a specified load per inch width of tire, and that load should probably be less for steel tires than for rubber tires.

The width and length of such vehicles is a matter of serious concern, especially on city streets. Where roadways have been designed to accommodate a certain number of lines of traffic

and the number of lines is reduced through an increase in the width of the vehicles, the capacity of the roadway is reduced in still greater proportion and, if this increase in width is allowed to proceed very costly street widenings will become necessary. In this case also it would appear to be necessary to prohibit absolutely the use on our highways of vehicles having more than a certain specified width. The State Legislature of Pennsylvania in 1913 passed a law prohibiting the registration of motor vehicles exceeding 90 inches in width of load and vehicle combined, except that motor buses for carrying passengers may be used within the limits of cities of the first, second and third classes, having a total width of 100 inches. This law also prohibits loads in excess of 24,000 lbs. for vehicle and load combined, in excess of 18,000 lbs. gross load on any axle, or 750 pounds for each nominal inch of width of solid tire.

Fortunately the tendency of the manufacturers of motor trucks appears to be in the direction of more moderate loads. Of 221 manufacturers producing commercial vehicles at the beginning of the present year, 133 confined themselves to those of less than three tons capacity. Of the 88 manufacturers offering trucks of more than three tons capacity, 12 appear to have increased this capacity in their models for this year, only two of these increases being to six tons; while six have decreased the capacity of their trucks, one from four to three and one-half tons, one from six to four tons, and one from seven and one-half to five tons. Of 12 newcomers in the field, only one offers a truck with a capacity of six tons and two of five tons, while the rest provide for smaller loads.

While the imposition of an absolute limit upon wheel loads and upon the dimensions of vehicles seems necessary to preserve our highways, both in the city and country, the development of the motor vehicle appears on the whole to present no problems to highway officials, especially problems relating to street congestion, which will not solve themselves with the more general improvement of our streets and roadways and with the adoption of a higher standard of real estate development which will make the subsidiary highways more attractive to those using motor vehicles.

ANNUAL "GET-TOGETHER" DINNER OF THE AMERICAN ROAD BUILDERS' ASSOCIATION, AT THE AUTOMOBILE CLUB OF AMERICA, NEW YORK, N. Y., NOVEMBER 3, 1916.

Another speaker was Alfred Reeves, General Manager of the National Automobile Chamber of Commerce. Mr. Reeves scored inadequate salaries paid to highway engineers and deplored the injecting of politics into highway and street work. He assured the association of the willingness of his organization to cooperate in all matters relating to the improvement of highways.

Maximilian Groten, Mechanical Engineer of the Imperial Russian Railways, told of the lack of means of communication in Russia, stating that only about 40,000 miles of highways existed in the entire empire. He spoke of the wealth of Russia in the soil, but stated that the absence of a system of highways interfered seriously with its development. Mr. Groten bespoke the interest of American engineers and capital in Russian highway construction.

Col. Stevens spoke about the work of the American Road Builders' Association and its influence upon the movement for improved highways, recommending that the organization devote itself entirely to the study of technical problems relating to road building.

Others who spoke were Franklin Q. Brown, Chairman of the Good Roads Committee of the Automobile Club of America; H. Eltinge Breed, First Deputy State Highway Commissioner of New York, and Arthur W. Dean, the president-elect of the association.

Short Course in Highway Engineering at the University of Illinois

The fourth annual short course in highway engineering will be held at the University of Illinois, January 8-19, 1917. The course will be held by the Department of Civil Engineering of the University, cooperating with the Illinois State Highway Department.

The program is now being prepared with a view to interesting those engaged in the development of country roads, the administration of municipal affairs, and the work of contracting. Each subject is to be handled by a specialist, those taking part including men well known in the highway engineering field.

While it is intended that the course shall afford those who attended last year an opportunity of continuing the work commenced then, arrangements will be made for those coming for the first time. The subjects to be treated will include social, economic and financial problems of road improvement, road laws and their administration, and technical problems of road and bridge construction. Special attention, it is stated, will be given to matters relating to bond issues and the development of county road systems. The course will be open to any one interested in highway work, and no fees will be charged.

Oneida County, Wis., will vote on a proposition to bond the county for $300,000 for the purpose of building 150 miles of roads to adjoining county lines.

Extensive Road Work in Stanislaus County, California, is contemplated by the County Board of Supervisors. According to present plans $1,500,000 in bonds will be issued and about 125 miles of road will be paved with the proceeds. The pavements will be of concrete with thin bituminous wearing surfaces.

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Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Formal Opening of the Bethlehem-Easton Highway in Pennsylvania

The formal opening of a highway between the Borough of Bethlehem and the City of Easton, Pennsylvania, occurred on Thursday, November 2. The celebration was held under the auspices of the William Penn Highway Association, the road being part of the route known as the "New York Extension of the William Penn Highway."

The William Penn Highway Association is an organization having for its object the completion of a road known as the "Wiliam Penn Highway" or "Pennsylvania Division of the Pikes Peak Ocean-to-Ocean Road," extending from Pittsburgh through Blairstown, Johnstown, Altoona, Lewistown, Harrisburg, Lebanon, Reading and Norristown to Philadelphia. Two branches of the road known as the "New York Extension" and the "Baltimore-Washington Extension" extend, respectively, from Reading through Allentown, Bethlehem and Easton, Pa.; Philipsburg, Hackettstown, Morristown and Newark to Jersey City, N. J., and from Harrisburg through Gettysburg southward to Baltimore and Washington.

The road formally opened on Thursday of last week is a section 42,244 ft. in length on State Highway Route 159. It is paved with reinforced concrete, 16 ft. wide, and was constructed by the maintenance division forces of the Pennsylvania Highway Department. The road when completed will extend from Easton to Allentown, the present plan being to build the section from Bethlehem to Allentown next year. Cement to the amount of 40,000 bbls. was donated by the cement manufacturers of the Lehigh Valley, while public spirited citizens of Lehigh and Northampton Counties contributed other material for the work. In the construction of the road special care was taken to follow the most approved specifications for concrete paving. This together with the use of modern equipment and the careful planning of the work has resulted in the building of a road which is believed to represent the best in concrete paving. Descriptions of the construction of the road have appeared in previous issues of "Good Roads" ("A Demonstration of Concrete Pavement Construction in Pennsylvania Highway Work"—"Good Roads," December 4, 1915, p. 300, and "Recent Developments in the Building of Concrete Roads," by William D. Uhler, a paper presented at the Pittsburgh Convention of the American Road Builders' Association, "Good Roads," March 4, 1916, p. 129).

GOVERNOR BRUMBAUGH OF PENNSYLVANIA AT THE DEDICATION OF THE NEW YORK EXTENSION OF THE WILLIAM PENN HIGHWAY.

The dedication of the road was attended by several thousand people from the immediate neighborhood and from Pittsburgh, Philadelphia, Scranton, Harrisburg and Reading, Pa., and New York City. Visitors from these cities were taken to Easton in special all-Pullman trains. At Easton the visitors were taken by automobile over the highway from Easton to Bethlehem where the dedication ceremony took place, then back to Oakland Park where addresses were made and luncheon served, and then to Easton.

VIEW ON THE CONCRETE ROAD BETWEEN EASTON AND BETHLEHEM, PA.—PART OF THE NEW YORK EXTENSION OF THE WILLIAM PENN HIGHWAY.

At the Bethlehem end of the road a barrier in the form of a banner bearing the inscription, "Pennsylvania—Bad Roads—New Jersey," was stretched across the road. On arriving at the banner, Governor Brumbaugh, of Pennsylvania, and George H. Viehmann, president of the New Jersey State Chamber of Commerce, the official representative of Governor Fielder, of New Jersey, took positions at each end of the barrier. At a signal two little Easton girls handed Gov. Brumbaugh and Mr. Viehmann silver scissors with which they cut down the barrier. Gov. Brumbaugh then removed a shovelfull of earth from the center of the road and Miss Elizabeth Traill Green of Easton broke a bottle of champagne on the road and christened it the "William Penn Highway." At the meeting at Oakland Park, William Jennings, President of the William Penn Highway Association, introduced Charles M. Schwab, President of the Bethlehem Steel Co., who presided over the meeting and made the first address. Mr. Schwab was followed by Gov. Brumbaugh, Mr. Viehmann, Gov. Fielder's representative; E. J. Cattell, of Philadelphia, representing Mayor Smith; William D. Uhler, Chief Engineer of the Pennsylvania State Highway Department; Congressman Henry J. Steele, who was largely instrumental in bringing about the improvement of the road, and others.

The attendance at the celebration was estimated at over 5,000, and the number of automobiles in line at nearly 1,000. All along the route of the automobile procession in Easton were large crowds and in front of the schools the children gathered to greet the visitors with songs and flags. Music was furnished by the Bethlehem Steel Band.

COMING MEETINGS

November 16-17—Washington State Good Roads Association—Annual convention, Centralia, Wash. Secretary, John R. Rea, Tacoma, Wash.

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 20, 1917—Western Paving Brick Maanufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

Washington State Good Roads Association

The annual convention of the Washington State Good Roads Association will be held at Centralia, Wash., on Thursday and Friday, November 16 and 17. The first session will be called to order by E. L. Farnsworth, President of the association. Addresses of welcome will be made by Mayor John Galvin of Centralia; T. J. Long, President of the Board of County Commissioners of Lewis County, and J. R. Buxton, President of the Centralia Commercial Club. The response will be made by Lawrence H. Brown, Secretary of the association.

Thursday afternoon a number of addresses will be made by visitors and the evening program will be in charge of Governor Lister of Washington.

The Friday morning session will be taken up principally by reports of committees and the discussion of subjects to be decided upon later. In the afternoon the Nominating Committee will make its report and the place of the next meeting will be decided upon.

MEETING

County Commissioners of Georgia

The third annual meeting of the Association of County Commissioners of Georgia was held at the Hotel Lanier, Macon, Ga., on Thursday, November 9, with President W. T. Winn in the chair.

The program included addresses of welcome by W. T. Anderson, Editor of the "Macon Telegraph," and Mallory H. Taylor, Chairman of the Board of Commissioners of Bibb County. Judge T. E. Patterson addressed the meeting on the subject of "The State Highway Department of Georgia."

Other addresses were made by Prof. Charles M. Strahan on "Practical Operation of Law and How Federal Aid Will Be Obtained," and Prof. A. D. Kneale on "Cost Method of Convict Labor."

PERSONAL NOTES

George E. Friesen has resigned as Superintendent of Bridges of Yakima County, Wash.

L. B. Stephenson has been appointed County Highway Engineer of Dickinson County, Ia., succeeding C. S. Arthur, resigned.

L. D. Snyder has been appointed Highway Engineer of Humboldt County, Ia., to fill the vacancy caused by the recent resignation of H. N. Legreid.

Col. Malcolm H. Crump, F. R. S. A., County Road Engineer of Warren County, Ky., has resigned, effective January 1, 1917. He will resume private practice, specializing in natural asphaltic material for surfacing highways, with offices at Bowling Green, Ky.

NEWS OF THE TRADE

Merger of Road Roller Companies

A merger has been effected of the interests of the Buffalo Steam Roller Co., Buffalo, N. Y., and the Kelly-Springfield Road Roller Co., Springfield, O. The new company will be known as the Buffalo Springfield Roller Company. Its main offices and factory will be located at Springfield.

The consolidated company, it is said, will be the largest concern in the world engaged exclusively in the manufacture and sale of road rollers. Its line will comprise rollers of all types for all purposes and in sizes varying from 2½ to 20 tons and will include the full line of Buffalo Pitts rollers in both the tandem and macadam types as well as the complete line of Kelly-Springfield steam and gasoline rollers.

The entire sales organization of the Buffalo Steam Roller Co. will be taken over by the new concern, and its present branch offices in Boston, Mass.; New York, N. Y.; Philadelphia and Pittsburgh, Pa.; Chicago, Ill., and Portland, Ore., will be continued.

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Number 21

Going in Debt for Good Roads*

By M. O. ELDRIDGE†

The subject of ways and means of obtaining better roads is one in which every one should be interested. The time has passed when it is necessary to discuss the benefits of good roads, because every one realizes that good roads are beneficial; the important thing at the present time is to know how to obtain good roads. We are now spending in this country about $250,000,000 annually in building good roads. At the present time there are outstanding in the United States about $375,000,000 of road and bridge bonds. If every dollar of this money were wisely and economically expended we would have good roads everywhere in a very short time, but unforunately that is not the case. We need more economical and efficient methods of raising and handling road funds in order that every dollar expended will accomplish a dollar's worth of work.

There are two ways by which funds are raised for good roads. One is by direct taxation and the other is by borrowing the money or by going in debt. If a community is able to do so, it should by all means pay as it goes. It should levy a sufficient tax to build and maintain roads and avoid paying interest on borrowed money.

The chief advantage in the cash tax system lies in the fact that no interest charges have to be paid by the present or future generations. There are, unfortunately, many undeveloped communities in the United States in which it becomes advisable to borrow the money for road building in the same way that farmers borrow money to buy farms. If some farmers had to wait until they had the money to purchase farms they would probably never become landowners. The same is also true of many counties in which systems of good roads are urgently needed to develop the resources and reduce the hauling costs. They would have to wait indefinitely for good roads if they had to depend upon a cash tax for the necessary funds. Unless a community is able to raise by a cash system of taxation enough money to finance the building of its main market roads within a reasonable length of time, the benefits resulting from the improvement are apt to be piecemeal. On the other hand, if a sufficient amount of money is raised either by direct tax or by a bond issue, the resultant benefits are immediate and certain, provided, of course, that the money is wisely and judiciously expended under competent supervision.

Competent supervision is the crux of the whole matter. The pay-as-you-go plan too frequently involves a too small annual appropriation with a relatively large outlay for supervision and maintenance, or, what is still worse, practically no supervision or maintenance. With a larger fund the county can better afford to employ competent supervision and do the work on a large scale or by contract. It is usually cheaper to do road work on the wholesale than on the retail plan. It is relatively cheaper to build 20 or 30 miles of road a year than 2 or 3 miles a year.

It is urged by those who are opposed to "going in debt for good roads" that the interest on the money invested amounts, in some cases, to two or three times the original cost of the improvement. If the right kind of bonds are issued and the money is wisely spent, the interest charges will not be two or three times greater and the benefits will usually far outweigh the interest on the funds invested.

A man from New Mexico told me yesterday that his county, a few years ago, invested in a bond issue to build a system of good roads, and that a recent traffic study had shown that the saving in hauling costs amounted to about $20,000 a year, which would be sufficient to pay for the whole bond issue, interest and principal, in about seven and one-half years. This was a good investment. Another gentleman told me a day or so ago that a county in Texas invested only four or five years ago in road bonds with which to build about twenty miles of roads, and that practically nothing has been spent on those roads for maintenance and that the roads have been almost entirely destroyed by the traffic and the elements. This was probably a good investment in the first place, but it was not safeguarded by proper maintenance. A county may properly borrow money to build roads, but should be required by law to set aside a sufficient annual tax to maintain its roads in good order so that the investment will be safeguarded.

Before a county invests in road building it should determine, first, the traffic area for the roads to be improved; second, the present and future traffic expressed in ton miles per annum; third, the estimated cost of hauling per ton mile at present and what it will be reduced to by the improvement; fourth, the roads to be improved and the probable cost of the improvement as borne out by these facts and by surveys and estimates made by a competent engineer; fifth, the present value of the lands abutting the roads and the increase in value which will probably result from the improvement; sixth, the present school attendance and the possibilities for school consolidation and increased attendance which will result from better roads; and seventh, the amount of tax that will be necessary to finance the undertaking whether the work is carried on by direct taxation or by funds derived from a bond issue.

A study of these facts will enable a county to determine whether it can afford to invest in good roads, how much it can afford to invest, how many miles of road it can afford to build, and what kind of roads it will be most profitable to build. Such a study will usually show that about 20 per cent. of the roads carry about 90 per cent. of the traffic, and that the first requirement of the average community is the improvement of about one mile of road out of every five miles in the county. It will also be found that it is not necessary to expend the same amount of money on all of the roads.

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*Address delivered before the International Farm Congress, El Paso, Texas, October 21, 1916.

†Assistant in Road Economics, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

For instance, one road may carry from four to five times the volume of traffic one or two miles out of the county seat or main market town as it may be required to carry ten or twelve miles from town, and consequently the county can afford to spend four or five times as much for the construction and maintenance of the first and second mile as for the tenth or twelfth mile. The greatest good to the greatest number can be accomplished by carrying this principle into practice.

If the county decides to go into debt for good roads, it should decide in advance what kind of bonds are to be issued, whether long-term bonds or short-term bonds, whether sinking fund bonds or serial bonds. The people of a county would do well to consider the advantage of short-term bonds for temporary improvements and long-term bonds for work which is more or less permanent, and serial bonds over the ordinary sinking fund bonds.

I know of a county which issued 30-year sinking fund bonds without providing a sinking fund. In 1910 these bonds became due and were retired by another issue of refunding bonds, and again without providing a sinking fund. You will all agree that this is poor financing. It frequently happens that bonds are issued covering a term of fifty years, and that by the time the bonds are paid the interest charges amount to twice or three times the cost of the work performed. The aggregate of the approved state bond issue in one of our great and wealthy states for 1914 amounted to $5,800,000, bearing interest at 4 and 4½ per cent. and covering a 50-year term before all would be redeemed. The state comptroller of that state calculated that the interest at the end of that time will have amounted to $8,800,000, or in round numbers $3,000,000 more than the total issue. In other words, the cost to the state will be almost $14,600,000 for the privilege of doing $5,800,000 worth of work. It is a question whether the convenience is worth the price, for a portion of the indebtedness is apt to long outlive the life of the improvement.

The character of bonds to be issued for road building is a matter that has been sadly neglected. Many millions of dollars could be saved annually if the serial bond plan were adopted instead of the sinking fund plan. To illustrate this point, let me explain the difference in the two plans and the saving which would result from adopting the serial method: Under the serial plan a certain amount of bonds is retired each year and the bonds so retired cease to be an interest charge on the county. Under the sinking fund plan none of the bonds are retired until the end of a definite period, and the entire sum raised bears interest during the entire life of the bond. The county, therefore, pays interest on the money so borrowed and in addition sets aside each year as a sinking fund an amount sufficient to retire all of the bonds when they become due. The sinking fund is deposited with banks and bears some interest. This interest ordinarily is only 3 per cent., whereas the county has to pay from 4 to 6 per cent. to the bondholders. The serial plan is a much cheaper method of raising money for road improvement even where the sinking fund bears interest as high as 4 per cent.

The total cost of a $100,000 serial bond extending over a period of 20 years with interest at 5 per cent. will amount to $152,500, while the total cost of a sinking fund loan covering the same time and bearing the same rate of interest with a sinking fund bearing 3 per cent. interest and compounded annually will amount to $174,431 for each $100,000 of bonds issued. Certainly this saving is worth considering.

It is not always advisable, however, to begin paying off a bond issue the first year of the loan. Counties should so arrange their financial obligations as to make the burden comparatively light at the very outset, thus giving the people a chance to develop their resources through the improvement of the roads. To do this the burden should be distributed so equitably over a period of years that it will avoid the two extremes of excessive tax levies on the one hand to pay off the debt too quickly and the extension on the other hand of the debt beyond the life of the utility in order to obtain a low tax rate.

The most desirable type of bond, therefore, appears to be one in which the first payment is made the fifth or sixth year from the date of issue and the other payments distributed equally over a certain term of years, depending on the probable life of the improvement.

Let us assume that $100,000 of 30-year, 5 per cent. serial bonds are to be issued. If the first payment is deferred to the end of the sixth year and the other payments made in equal annual amounts during the remaining 24 years, the total outlay for interest and principal will amount to approximately $190,000. The total cost of a $100,000 sinking fund loan covering the same term and bearing the same rate of interest with sinking funds bearing 3 per cent. interest compounded annually will amount to $203,500, thus showing a saving for the deferred serial bond of $13,500 for every $100,000 of bonds issud. By adopting the deferred serial bond instead of the sinking fund plan the average county could save more than enough to pay all engineering and overhead expenses.

In this connection I wish to quote from an article published in "The Annalist" in October, 1915. This article was prepared by Mr. Alfred D. Chandler of New York. Mr. Chandler says:

> When it was revealed to the Finance Committee of the New York Constitutional Convention that for every $100,000,000 of New York's standard fifty-year sinking fund bonds at 4 per cent. the difference in interest between the sinking fund and the serial bond method was the astounding sum of $98,000,000, while the difference in actual cost, if the sinking fund earned the acceptetd 3½ per cent., was $35,690,000, or even if it could earn 6 per cent. was $14,934,400, it brought that convention to an impressive realization of New York's past neglect on this score and of the needless expenses attached to its present outstanding bonded debt, state and municipal, of about $2,000,000,000, or about double the bonded debt of the United States.

The objection raised sometimes to serial bonds is that they do not bring as good a price on the bond market as the sinking fund bond. Let me read to you what Mr. Chandler says on that subject:

> Some hesitation arose as to the receptivity of the New York market for serial bonds, all doubts of which happily were removed pending the sessions of the convention by the successful marketing (June 29, 1915) of New York City's first serial bond loan for $24,000,000 at a higher price than was obtained for a simultaneous sinking fund loan of $46,000,000.

In conclusion I wish to call your attention to another important point that should be considered when bonds are issued for road improvement. The life or term of bonds should be approximately the same as the duration of the improvement. It is a mistake to issue 50-year bonds for roads which will not last ten years. In other words, the indebtedness should be liquidated at a rate at least equivalent to the depreciation of the improvement thus financed. Some of the states have laws fixing the term and character of the bonds that may be issued. So far as I know, New Jersey is the first and only state to limit the term of bonds to the probable usefulness of the improvement. The term of bonds in New Jersey is fixed by statute as follows: Stone, concrete and iron bridges, 30 years; roads and streets built of concrete 6 ins. thick, or of block of any material or of sheet asphalt laid on concrete foundation, 20 years; bituminous concrete construction, 15 years; water bound macadam or penetration process, 10 years, and gravel, 5 years. The New Jersey law provides that all municipal bonds shall be paid in annual installments commencing not more than two years from their date of issue; in other words, deferred serial bonds. Other states would do well to follow New Jersey's leadin this matter. If they did it woud have the effect of standardizing the issuance of road bonds and would result in the saving to the taxpayers of many millions of dollars.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

California Voters Approve the $15,000,000 Highway Bond Issue

The $15,000,000 state bond issue for the completion of the California highway system was approved by the voters at the election November 7, thus insuring the construction of approximately 1,000 miles of roads in addition to the 1,122 miles already finished at an expenditure of $16,000,000.

Initial work will be done on the trunk lines extending from San Diego, Cal., to the northern boundary of the state. One-fifth of the sum voted will be used for the construction of new highways, among which will be one from Los Angeles north into the Sequoia forests.

In addition to state funds, California has available more than $250,000 from the federal fund.

Pennsylvania and Delaware Discontinue Automobile Reciprocity Privilege

The automobile reciprocity privilege existing between the states of Pennsylvania and Delaware has been withdrawn insofar as it affects commercial vehicles. Delaware has notified Pennsylvania that under an amendment to the automobile law of that state, all Pennsylvania commercial cars must register in Delaware as soon as they cross the state line.

Because of this notification from Delaware, State Highway Commissioner Black of Pennsylvania has issued a ruling that all Delaware commercial vehicles must secure Pennsylvania registration immediately upon entering the state. This applies to all forms of motor vehicles used for commercial purposes.

The effect of this ruling is far reaching because it applies not only to those commercial vehicles engaged in continuous interstate commerce between Pennsylvania and Delaware, but also to commercial vehicles making only occasional trips between the two states.

New Jersey Voters Approve Egan Bill With $7,000,000 Road Bond Issue

At the recent general election, the voters of New Jersey approved what is known as the Egan Bill, which provides for an issue of $7,000,000 in bonds for the purpose of improving the system of state roads.

The routes designated in the bill have a total length of approximately 555 miles. Details of the plan were given in "Good Roads" for June 17 and November 4.

Dallas County, Texas, Votes $500,000 Bond Issue for Road Work

The voters of Dallas County, Tex., have approved the project to issue bonds to the amount of $500,000 for the purpose of raising to a point above high-water level, the roads in what are known as the overflow districts of the county.

This work is a part of the plan prepared by J. F. Witt, County Engineer, and outlined in "Good Roads" for September 30. The entire plan involves the expenditure of about $1,600,000. It was decided, however, that to issue bonds in excess of the amount voted would place the county too near the limit of its bonded indebtedness to permit the issue of bonds for other necessary work.

Motor Truck Club of America Holds Meeting in New York City

At a meeting of the Motor Truck Club of America held at the Automobile Club of America, New York, N. Y., on Wednesday evening of this week, "State Roads and Their Use by Motor Trucks" was the topic of discussion. The speakers of the evening were Edwin Duffey, State Commissioner of Highways of New York, and Arthur H. Blanchard, Professor of Highway Engineering at Columbia University.

Prof. Blanchard, the first speaker, gave an illustrated talk on "State Roads for Motor Trucks." He touched briefly upon the traffic to which roads are at present subjected and which they may be expected to carry in the future, the necessity for a proper organization of road building forces, and the methods of construction to be followed in building roads suitable to heavy motor traffic. Prof. Blanchard showed a number of views illustrating the damaging effects of horse-drawn traffic, pointing out that in many cases vehicles of this kind are very destructive to roads of certain kinds. He also showed views of different types of motor vehicles, pointing out their effect upon road surfaces. He expressed the belief that stringent regulations will be necessary for motor-bus traffic, pointing out the increasing use of this type of vehicle on New York state highways. He also expressed the belief that a national system of highways will eventually be provided, a start having been made by the recent bill providing for federal aid.

In discussing the organization of road building forces Prof. Blanchard referred to the organization of the Philadelphia Bureau of Highways and Street Cleaning which he said was representative of the best.

The latter part of Prof. Blanchard's address dealt with various types of roads in common use. Brief descriptions of the various kinds were given, emphasis being placed in each case upon the more important details of construction.

Commissioner Duffey, who is chairman of the Motor Truck Registration Fee Commission, prefaced his remarks on the subject of the commission's work by a somewhat detailed description of the trunk line system of New York state and a resume of the work accomplished and in progress. He outlined briefly the proposed plan for utilizing New York's portion of the federal aid funds, saying that he hoped that it would be possible to use it for the completion of certain connecting links in the state trunk line system for which no provisions are made by the existing laws apportioning the state funds.

Commissioner Duffey then outlined briefly the problem with which the commission is confronted. He emphasized the necessity of putting the study of the question upon a scientific basis, and said that it was the intention of the commission to follow that course. The commission's engineer, he said, has been at work on the subject for some months and has secured data from other states and from Great Britain. When the state trunk line system is completed, according to Commissioner Duffey, it will comprise about 9,000 miles of roads representing an investment of about $160,000,000. In addition, there will be a system of county and town roads with a mileage of from 25 to 50 per cent. greater than that of the state system. These two systems will have cost in the neighborhood of $250,000,000, all of which has been spent within about 12 years. He urged strongly the necessity for conserving these existing roads by such regulations as may be found necessary and advisable.

Commissioner Duffey's remarks were followed by a general discussion during which the Commissioner answered a number of questions put by the members of the club. A hearing is to be held by the Motor Truck Registration Fee Commission on the forenoon of Wednesday of next week, and Commissioner Duffey urged that the members of the Motor Truck Club and others interested be present at that time to give the commission the benefit of their knowledge of motor truck traffic and their views as to its regulation.

COMING MEETINGS

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 20, 1917—Western Paving Brick Maanufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

January 23-25, 1917—American Wood Preservers' Association—Annual meeting, New York, N. Y. Secretary, F. J. Angier, Baltimore, Md.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

February 8-10, 1917—American Concrete Institute—Annual meeting, Hotel LaSalle, Chicago, Ill. Secretary, Harold D. Hynes, 1418 Walnut Street, Philadelphia, Pa.

American Road Builders' Association

While the program for the 14th annual convention of the American Road Builders' Association is still in course of preparation, it is learned that many of the leading specialists in highway work and bridge building have informed the Executive Committee of their intention of being present and participating in the proceedings.

The convention will be held at Boston, Mass., February 5 to 9, 1917. Reservations of exhibition space at the Eighth National Good Roads Show, which will be held in conjunction with the convention, indicate that it will be the most important exhibition in the history of the organization.

Paving Brick Institute

A meeting of the Paving Brick Institute will be held at the Hotel Statler, Cleveland, O., December 5 and 6. The meeting of the institute, scheduled for the morning of December 6, will be continued in the afternoon, if necessary, or if time is available, there will be an inspection trip of interest to all members.

The following papers comprise the program: "The Use of Powdered Coal," A. A. Holbeck, Bonnot Co., Canton, O.; "Producer Gas in Burning Brick," John T. Underwood, inventor of the Underwood producer gas burning system; "Equipment Efficiency," F. R. Kanengeiser, Bessemer Limestone Co., Youngstown, O.; "Labor," George D. Orr, Purington Paving Brick Co., Galesburg, Ill.; "The Development and Application of a Bonus System," S. M. Duty, Medal Paving Brick Co., Cleveland, O.

An important meeting of the Cost Committee of the institute will be called prior to the meeting, to prepare a report to be made at that time.

PERSONAL NOTES

C. N. Perry has resigned as County Surveyor of Imperial County, Cal.

J. W. Frazier has resigned as State Highway Superintendent of Potter County, Pa., to engage in private business.

A. L. Crissinger has been appointed State Highway Superintendent of Beaver County, Pa., filling the vacancy caused by the removal of J. Henry Geer.

A. B. Howard has been appointed General Foreman and will have charge of the roads in Jefferson County, Pa., under the State Highway Department.

George R. Wade, Brawley, Cal., has been appointed County Surveyor of Imperial County, Cal., to succeed C. N. Perry whose resignation is noted elsewhere in this column.

H. M. Dorwart, State Highway Superintendent of Jefferson County, Pa., has been promoted to the superintendency of Potter County, where he takes the place of J. W. Frazier, whose resignation is noted elsewhere in this column.

NEWS OF THE TRADE

The Tiffin Wagon Co., Tiffin, O., has issued a small folder, illustrated with halftones, descriptive of the Tiffin sprinkling wagons and flushing machines.

The Cleveland Brick & Clay Co., Cleveland, O., has been added to the list of licenses of the Dunn Wire-Cut Lug Brick Co., Conneaut, O. The Cleveland company has a daily productive capacity of 60,000 blocks. J. L. Higley is President and A. L. Hendershot is Secretary.

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Road Improvement in McDowell County, West Virginia

Some years ago, when engineers, making a reconnoissance for a railroad, invaded the southern part of West Virginia, they climbed around steep hills and scrambled over boulders in the streams. The railroad was finally surveyed and constructed along the Tug Fork and Elkhorn branches of the Big Sandy River.

Among the contractors who drifted along with this work was one who satisfied himself with the environment and founded a home in the town of Welch, now the county seat of McDowell County. At this time the only means of access to Welch was by the railroad, excepting some trails and bridle paths, leading over the steep mountains.

This contractor, now known throughout West Virginia as "Colonel" W. J. McClaren, purchased, in 1909, the first buggy to be brought into McDowell County. It was unloaded at Welch, and could only be used for a short distance out of the town.

In the county prison there was a large number of prisoners; at that time there were a number of saloons in McDowell County and the jail facilities were inadequate for the number of prisoners produced. There were, in the County Court, conscientious, studious business men who carefully weighed all of the problems confronting them, and after some discussion decided to try the experiment of a prison camp for the purpose of providing more wholesome quarters for convicts.

One of the members of the court at that time was Dr. H. D. Hatfield, now Governor of West Virginia, whose practice necessitated his traveling the various trails and paths throughout the county. This, doubtless, brought before him the importance of good roads in a manner not available to the other members of the court. Likewise, being a physician, he recognized the importance of sanitation in the prison and prison camps. Another member of the court was James Jones of Switchback, a wealthy coal operator, who had a vision of better highway conditions in southern West Virginia.

The camp was established and Col. McClaren was placed in charge as county engineer. His experience as a contractor had equipped him for handling men. Other camps were established at various points throughout the county and in June, 1914, there were 180 prisoners working from these various prison camps, besides a number that were in jail awaiting trial. At the present time there are less than 40 prisoners at work and in jail together.

On March 18, 1915, the citizens of Big Creek District by a vote of 551 for to 223 against, decided upon a bond issue of $165,000 to grade approximately 35 miles of road, this improvement being a continuation of the work done by force account and prison labor. The work was contracted for a lump sum, the contractor undertaking to do the grading, build all drainage structures and to complete the work, making a 16-ft. road bed over the entire distance. About 60 per cent. of this work has been completed. The engineering is in charge of H. B. Wright, of Berwind, who is acting in the capacity of assistant county engineer.

The maximum grade used in getting over mountains is 4 per cent. on one side and 7 per cent. on the other. The objection to this style and type of contracting has developed in the failure to get proper radius to the curves used in some points upon the work.

On December 18 the citizens of Sandy River District voted a bond issue with a maximum levy of 50 cts. on each $100 of assessed valuation. This bond issue, as well as the bond issue in Big Creek District, was sold to the West Virginia State Board of Public Works for the benefit of the Workmen's Compensation Fund. The work in this district has not been started, but bids will be received and contracts awarded on a unit price basis, during the early winter months, according to the statement of James Jones and H. N. Eavenson, members of the County Court. The road movement thus far in McDowell County has been preparatory for larger results.

The assessed valuation of Adkins District is $9,849,568. Against the property of the district is a bonded indebtedness of $40,000 for school purposes, and $4,783 being the portion of the county debt chargeable to the district. After deducting the sinking fund there remains $38,533.01. The possible indebtedness that the district could incur, under the constitution of the State of West Virginia, is $492,478.40. The district has at the present time 29 miles of graded road which it is proposed to improve by paving with brick or concrete, and four miles of side roads to be graded. For this purpose a $450,000, 23-year bond issue with a 35 cts. maximum levy is proposed. A straight serial bond issue for 20 years would be cheaper in the total cost, but would require a maximum levy of 46 cts. the first year. Therefore, the 23-year issue with a lower rate of levy has been recommended.

Brown's Creek District, with an assessed valuation of $14,967,472, has a bonded indebtedness for school purposes of $178,000 and $7,269.66, the district's portion of the present county indebtedness. The sinking fund leaves an indebtedness of $179,611.71. The possible indebtedness of the district would be $748,372.10. There are 29 miles of 14-ft. main roads within the district that are to be paved and 23 miles additional that are to be graded. For this purpose a bond issue of $565,000 has been proposed. The issue is a 21-year serial, with a maximum levy of 30 cts. Consideration was given to an 18-year serial bond issue with a maximum levy of 35 cts., which showed a difference of $68,300 in the total cost to the community.

Elkhorn District has an assessed valuation of $5,414,262 and can create an indebtedness of $270,713.10. The district, as such, has no indebtedness at the present time excepting $2,629.26 which is its portion of the county debt. There are

12 miles of main road that are to be improved by first-class paving and five miles of side road to be graded. For this purpose, a bond issue of $210,000 has been proposed, to be a 5 per cent. 17-year serial issue, maximum rate of levy, 35 cts. This bond issue is the most economical that the valuation and assets of the district will permit, considering the weight of the levy.

North Fork District has an assessed valuation of $4,298,276; a bonded indebtedness of $55,000 and the portion of the county's indebtedness chargeable to the district is $2,067.55. After giving credit for a sinking fund, there is outstanding an indebtedness of $52,791.83. The possible indebtedness for the district is $214,913.80. There are ten miles of main road and three miles of side road proposed for improvement. For this purpose a bond issue of $160,000 has been proposed, the issue to be a 21-year serial with a maximum levy of 30 cts.

The four issues aggregate $1,385,000. The total mileage of road to be improved by the issues is 80 miles of first-class paving and 35 miles of grading. This improvement, when linked up with the improvement provided for in Big Creek and Sandy River Districts, will make more than 200 miles of improved road in McDowell County, and if all of the proposed issues carry, the county's investment in road improvement, when completed, will aggregate $1,843,000 from bonds, and $272,591.91 from levies for road improvement. This will make McDowell County the banner county of the state from the standpoint of investment for improved roads.

TABLE I.—MILEAGE OF ROADS CONSTRUCTED AND MAINTAINED IN McDOWELL COUNTY, W. VA., BY FORCE ACCOUNT AND CONVICT LABOR FROM 1910 TO 1916.

District	Construction, Miles				Maintenance, Miles			
	Force Account	Convict Labor	Total	Cost	Force Account	Convict Labor	Total	Cost
Adkins	11.05	11.75	22.80	$33,368.09	186.00	52.00	238.00	$12,296.32
Big Creek	8.00	....	8.00	21,282.98	240.00	....	240.00	6,614.46
Brown's Creek	4.70	18.69	23.39	52,617.16	224.00	116.00	340.00	12,228.83
Elkhorn	4.15	5.17	9.32	25,115.74	56.00	24.00	80.00	10,157.11
North Fork	6.75	....	6.75	23,033.58	49.00	25.10	74.10	3,537.34
Sandy River	7.34	....	7.34	12,069.83	417.00	....	417.00	7,962.43
Total	41.99	35.61	77.60	$168,487.38	1,172.00	217.10	1,389.10	$52,796.49

A visitor to McDowell County, who travels over the improved roads now to be found, takes into consideration the topography over which the improvements have been made, and compares the cost, cannot but admire the progressive spirit that has actuated the citizens of the county, as well as the courage displayed in undertaking such projects.

Col. McClaren's pioneer buggy is still plying between the jailer's home and the prison camps, conveying food to the prisoners, but the Colonel has ceased to use this buggy for his private use and now rides about the county in an automobile, and in place of the little buggy shed that was once sufficient, modern garages have sprung up. This is the result of but eight years progressive development and the expenditure of less than $300,000.

TABLE II.—TOTAL COST OF CONSTRUCTION, MAINTENANCE, ETC., OF ROADS IN McDOWELL COUNTY, W. VA.

District	Construction	Maintenance	Equipment	Supplies	Total
Adkins	$33,368.09	$12,296.32	$8,416.59	$5,639.58	$59,720.58
Big Creek	21,282.98	6,614.46	1,905.27	1,008.96	30,811.67
Brown's Creek	52,617.16	12,228.83	5,061.22	11,021.77	80,928.98
Elkhorn	25,115.74	10,157.11	2,652.79	3,512.50	41,438.14
North Fork	23,033.58	3,537.34	3,008.89	2,584.67	32,164.48
Sandy River	12,069.83	7,962.43	4,024.41	2,471.39	26,528.06
Total	$167,487.38	$52,796.49	$25,069.17	$26,238.87	$271,591.91

As to what will be the development in McDowell County in the next seven years after the expenditure of the contemplated funds, no one at the present time can forecast, but it is safe to say that when the proposed improvement is completed, travel in McDowell County will be as attractive, and the scenery as picturesque as can be found in any section of the country.

University of Oklahoma to Conduct First Annual Good Roads Week

Oklahoma's first annual Good Roads Week will be held at Norman, Okla., January 1 to 6, under the auspices of the University of Oklahoma. The proceedings will take the form of a course in road work, and will be planned especially for the benefit of county commissioners, engineers, legislators and good roads organizations.

Arrangements are in charge of Prof. J. I. Tucker, State Consulting Engineer, and Pro. R. C. Terrell, former State Roads Commissioner of Kentucky, a new member of the faculty of the University of Oklahoma.

Among those who will take part in the proceedings are W. S. Gearhart, State Engineer of Kansas; George R. Noble, State Highway Commissioner of Oklahoma, and Max L. Cunningham, State Engineer of Oklahoma.

New Jersey Candidates for Road Inspectorships Take Examination

Candidates for the position of Road Inspector under the State Department of Public Roads of New Jersey, were recently subjected to an examination under the general direction of the State Civil Service Commission.

Following the plan inaugurated last year and noted in "Good Roads" for July 10, 1915, the examination was divided into two parts, a written examination in a number of subjects and an oral examination conducted by James H. MacDonald, former State Highway Commissioner of Connecticut, who, as was the case in 1915, was retained for the purpose by the Civil Service Commission.

The plan of having an examiner from outside of the state originated with the New Jersey Commission and the fact that the first state to accept state aid in road building called upon the oldest State Highway Commissioner, in point of service, to conduct the examination, seems particularly fitting.

The New Jersey Civil Service Commission adopted the following resolution in appreciation of Mr. MacDonald's work:

Resolved: That this commission express to Mr. MacDonald its gratification on the able and efficient methods employed by him in the recent examination for road inspectors, and its belief that this examination and the one previously conducted by him have set a standard which will greatly aid in an efficient and thorough plan of road inspection in the State of New Jersey.

Marion County, Ind., has about 32 miles of concrete highways under construction.

The Jacksonville, Tex., Road Precinct has voted to issue $250,000 worth of bonds for the construction of 150 miles of roads.

Surveys Are Being Made in Sacramento County, Cal., for the county highway system to be built under a recently voted bond issue of $1,750,000.

A movement is on foot in Kane County, Ill., to name all county highways after men who have been active in the good roads movement in the county.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Employment of Louisiana Convicts on Roads Urged by Commerce Association

The New Orleans, La., Association of Commerce has inaugurated a movement to secure the employment of convict labor on the public roads of the state.

Louisiana prison labor was used on the roads from 1909 to 1911, and, according to reports, the results secured were satisfactory. The practice was discontinued, however, in order that the convicts might be employed in the building of levees to protect low lands from floods.

The state constitution forbids the leasing of convict labor, and provides that prisoners may be employed only on public work and farms.

The New Orleans Association of Commerce advocates paying wages to convicts employed on road work in order that the prisoners may contribute to the support of their families.

Highway Commission of Three Members Proposed for Texas

A bill providing for the creation of a State Highway Commission, has been prepared for presentation to the Texas Legislature at its meeting in January.

Briefly, the proposed measure provides for a commission to consist of three members, to be appointed by the Governor. One of the commissioners is to devote his entire time to the work of the commission and is to receive a salary of $4,000 a year.

The bill also proposes a tax of 25 cents per horsepower on motor vehicles, with a minimum tax of $7.50 and a maximum of $15 per annum. One-third of the $2,000,000 which it is estimated will be derived from this tax, is to be rebated to the counties from which it originated and the balance is to be used for the construction of a system of state roads.

The Texas Good Roads Association appointed a committee to draft the bill providing for the creation of the commission, as noted in "Good Roads" for September 30. The committee was composed of the following:

George D. Marshall, Austin; Homer D. Wade, Stamford; H. B. Terrell, State Comptroller, Austin; Judge George N. Denton, Waco; Leonard Tillotson, Sealy; Judge Adrian Pool, El Paso; Walter D. Caldwell, Austin; Judge T. L. Beauchamp, Paris; Carlos Bee, San Antonio; C. O. Laney, Dallas; William T. Bagby, Halletsville; F. M. Gibson, Bonham; Judge Jesse M. Brown, Fort Worth; Robert J. Eckhardt, Taylor; D. E. Colp, San Antonio, Secretary, Texas Good Roads Association.

Ottawa County, Oklahoma, Club Members Pay Monthly Sum for Highway

Residents of Ottawa County, Okla., have formed a club, the members of which are pledged to contribute $10 a month each for a period of 12 months, for road construction.

The club already has more than 100 members, and according to report, the membership is rapidly increasing. The funds obtained are to be used for the construction of the Ottawa County branch of the Jefferson Highway.

Cleveland, Ohio, Votes $3,000,000 Bond Issue for Street Repairs

A bond issue of $3,000,000 was voted in Cleveland, O., at the recent election, the funds to be used for repaving a number of streets and the repair of existing pavements. Mention of this issue was made in "Good Roads" for September 30 and June 10.

The officials in charge of the proposed work have already prepared a tentative program of repaving and repairs to be done during the coming year. It is understood that at least ten miles of streets are included in the proposed work for 1917, among them being the thoroughfares most urgently in need of attention.

Eleven Washington Counties Have $2,363,746 Available for 1917 Road Work

In eleven counties of the State of Washington, reports from which are available at this time, the total sum to be expended for road work during the coming year amounts to $2,363,746.

The funds available will be expended under the authorization of the respective boards of county commissioners and are, in a majority of cases, divided into three classifications: Permanent highway fund, road and bridge fund and road district fund.

The counties reporting, together with the funds available in each, are shown below.

County	Permanent Highways	Road & Bridge	Road District	Total
Cowlitz	.....	117,000	.....	117,000
Douglas	17,392	24,527	30,000	71,919
Franklin	15,000	29,800	61,120	105,920
Garfield	16,000	11,398	20,608	48,006
Grant	24,000	60,000	65,000	149,000
Klickitat	21,416	15,000	52,205	88,621
Pacific	21,941	52,884	103,588	178,413
Skagit	34,858	56,137	106,128	197,123
Skamania	7,932	24,527	30,000	62,459
Snohomish	.....	.....	.....	1,194,000
Whitman	68,713	35,000	47,572	151,285
Total				$2,363,746

Okmulgee County, Okla., recently voted to expend $800,000 for a system of good roads.

Bell County, Ky., recently voted $105,000 additional road bonds, making a total of $390,000 voted in the county.

COMING MEETINGS

November 23-25—National Municipal League—Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 7-9—Safety First Federation—Annual convention, Baltimore, Md. Secretary, W. D. Heydecker, 29 West 39th Street, New York, N. Y.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 20, 1917—Western Paving Brick Maanufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

January 23-25, 1917—American Wood Preservers' Association—Annual meeting, New York, N. Y. Secretary, F. J. Angier, Baltimore, Md.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

February 8-10, 1917—American Concrete Institute—Annual meeting, Hotel LaSalle, Chicago, Ill. Secretary, Harold D. Hynes, 1418 Walnut Street, Philadelphia, Pa.

Safety First Federation of America

The second annual convention of the Safety First Federation of America will be held at Baltimore, Md., December 7, 8 and 9.

One of the principal subjects to be considered will be a uniform code of signals for use in the regulation of traffic.

Another matter which will come up for discussion is a standard code of traffic regulations. This code has been prepared under the direction of the Street Traffic Committee of the Federation and is said to be very comprehensive.

The annual meeting of the Oklahoma Society of Engineers will be held in Tulsa, Okla., December 27-28. The program is in course of preparation and will include inspections of the new Arkansas River Bridge, various roads and the convict camp. Officers of the State Highway Department and all county engineers are expected to attend. H. V. Hinckley, Oklahoma City, is Secretary of the society.

MEETINGS

Alabama Good Roads Association

The 20th session of the Alabama Good Roads Association was held at Birmingham, Ala., November 15-16, and was well attended.

Resolutions were adopted favoring the abolition of the convict lease system and the employment of prisoners on road work; providing for the appointment of a committee to organize a campaign for good roads legislation in the state, and designating Birmingham as the official headquarters of the association, where all annual meetings shall be held.

The following officers were elected: President, John Craft, Mobile; Vice-Presidents, John M. O'Neill, Birmingham; J. E. Pearce, Huntsville; Frank S. White, Birmingham, and B. W. Duke, Gadsden; Secretary, J. A. Rountree, Birmingham.

National Municipal League

The annual meeting of the National Municipal League is being held in Springfield, Mass., the sessions having started on Thursday of this week. The meeting will adjourn today.

The program includes papers and discussions on a wide variety of municipal problems and concludes today with a luncheon at which there will be three-minute discussions by delegates on "The National Municipal League: Its Works and Activities—How to Improve Them."

PERSONAL NOTES

S. R. Oldaker has been appointed City Engineer of Hermiston, Ore.

A. E. Foreman, Chief Assistant to the City Engineer of Victoria, B. C., has resigned.

E. W. Kibbey, County Engineer of Koochiching County, Minn., has resigned to engage in private business.

Jacob L. Bauer has been reappointed County Engineer of Union County, N. J., with headquarters at Elizabeth, N. J.

Guy H. Miller, Watertown, N. Y., has been appointed Senior Highway Engineer in the U. S. Office of Public Roads.

Parker L. Hardeson, the last State Highway Commissioner of Maine, previous to the establishment of the present State Highway Commission, died recently.

William F. Coleman, County Surveyor of Warren County, Ky., has been appointed County Road Engineer to succeed Col. Malcolm H. Crump, notice of whose resignation appeared in "Good Roads" for November 11.

NEWS OF THE TRADE

The Oklahoma Portland Cement Co. has opened a South Texas office at Houston, Tex., in charge of Gill F. Cotton.

Recent additions to the list of licensees of the Dunn Wire-Cut Lug Brick Co., Conneaut, O., are the Jamestown Shale Paving Brick Co., Jamestown, N. Y., and the Purington Paving Brick Co., Galesburg, Ill. The former has a daily capacity of 65,000 blocks and the latter, one of the largest paving brick concerns in the country, has a daily capacity of 350,000.

The Police Jury of Grant Parish, La., has under consideration a proposition to call a special election on the question of issuing bonds to the amount of $300,000 for good roads.

County Highway Commissioner Hintgen of LaCrosse County, Wis., reports that 25.19 miles of macadam roads have been built and repaired and 18 bridges constructed in the county since January 1, 1916.

State Geologist George F. Kay of Iowa, in his annual report, urges the construction of roads throughout the state and calls attention to the variety of road building materials to be found in the various counties.

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Number
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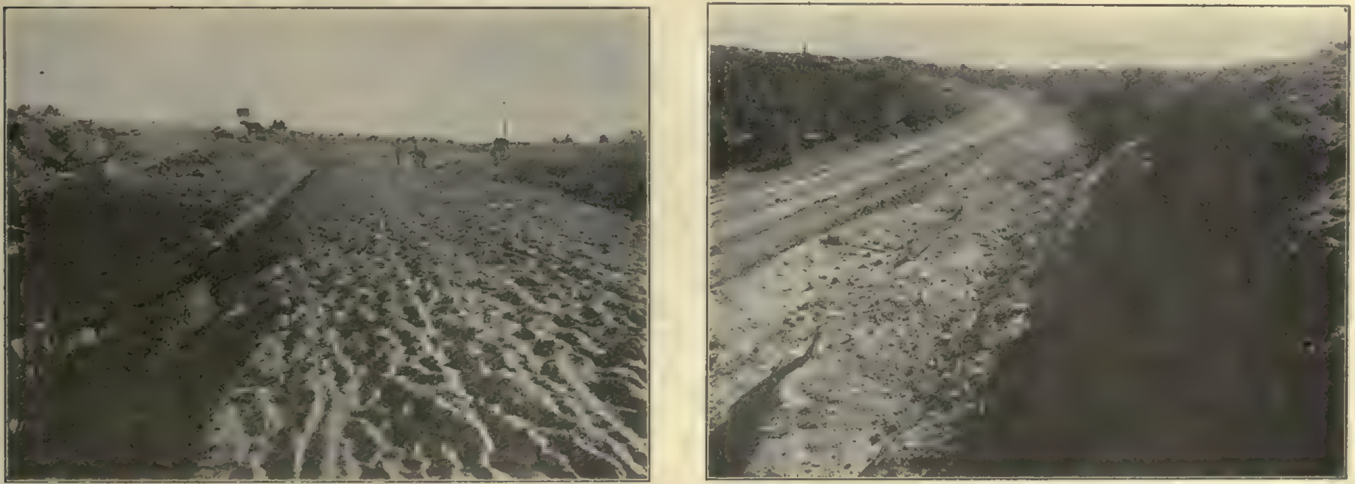
State Highway Work in New Mexico

By JAMES A. FRENCH*

New Mexico is rectangular in shape and is mountainous in sections, the ranges with few exceptions running in a general northerly and southerly direction. Two rivers of prominence, the Rio Grande and the Pecos, with their tributaries, rise in these ranges and dominate the location of routes of travel, both north and south and east and west. Other streams affect road location, but to a lesser degree. We have, therefore, the plains, the mountains and the valleys, each contributing to the problem of developing a suitable state highway system its factors of population to be served, road material, and character of topography.

The area of the state is approximately 122,503 square miles. Its extreme length from north to south is 390 miles and its width from east to west 350 miles. A population of 350,000 is scattered throughout this vast area, and to serve the people by proper traffic communication involves immense expenditures of money in construction and a considerable amount in maintenance. The taxation upon so few people and the immense road mileage necessary places a burden upon the people that may at first appear to be heavy, but I believe that we are equal to the task and can cheerfully pay the bill in the expectation of the benefits to be derived.



A NEW MEXICO STATE ROAD BEFORE AND AFTER PARTIAL COMPACTION BY RAINS.

Within a decade the idea of having a road over which it was possible to travel comfortably occurred to no one unless he found existing roads absolutely impassable. Today the demand is, I might say, terrific, for easy, comfortable travel without annoyance of any kind. Until very recently traffic from one county to another was almost unheard of except by railroad. The state highway act of 1912 was the result of a sudden change in public sentiment that had been fast growing and had come to demand intercounty, statewide communication. The act in itself is sufficient to provide for proper state highway construction, but it is not adequate to produce the money necessary to build fast enough to keep up with the urgent demand for state highways. In fact, the resources at the disposal of the state highway commission in the past have been sufficient only to improve the impassible places; and the same is true of present resources. The results of the work done, however, have been an incentive to the taxpayers to ask for more taxation to make possible further work.

The state highway system as outlined at present is the result of study by the State Highway Commission, some legislative acts and the submission of routes by good roads organizations. The system comprises 3,540 miles of state highways which may be divided into three distinct classes in accordance with the type of construction adopted. These classes are distinct one from another, both as to construction and cost of maintenance, the differences being caused by the varying topographic, geological and climatic conditions within the enormous area involved. The classes are: (1) the mesa roads, (2) the mountain roads, (3) the valley or river roads. In each class several varieties of construction are required, but the details of these cannot be taken up here.

The mesa roads are those located on the mesas or plains, where the material found is splendidly adapted to inexpensive road construction. This is especially true where the center line profile is approximately level, with little or no cross drainage. As the profile departs from the level it is necessary to grade and drain the road and treat it with a light surfacing of sand or gravel. In fact, it might be said that whenever a grade is thrown up it should be treated with a surfacing requiring much less maintenance. The maintenance of highways costs little and can be taken care of by small working crews making periodical trips. This method of maintenance is necessary because of the sparsely settled communities traversed by these highways. The mesa roads have a total mileage of 2,510 miles.

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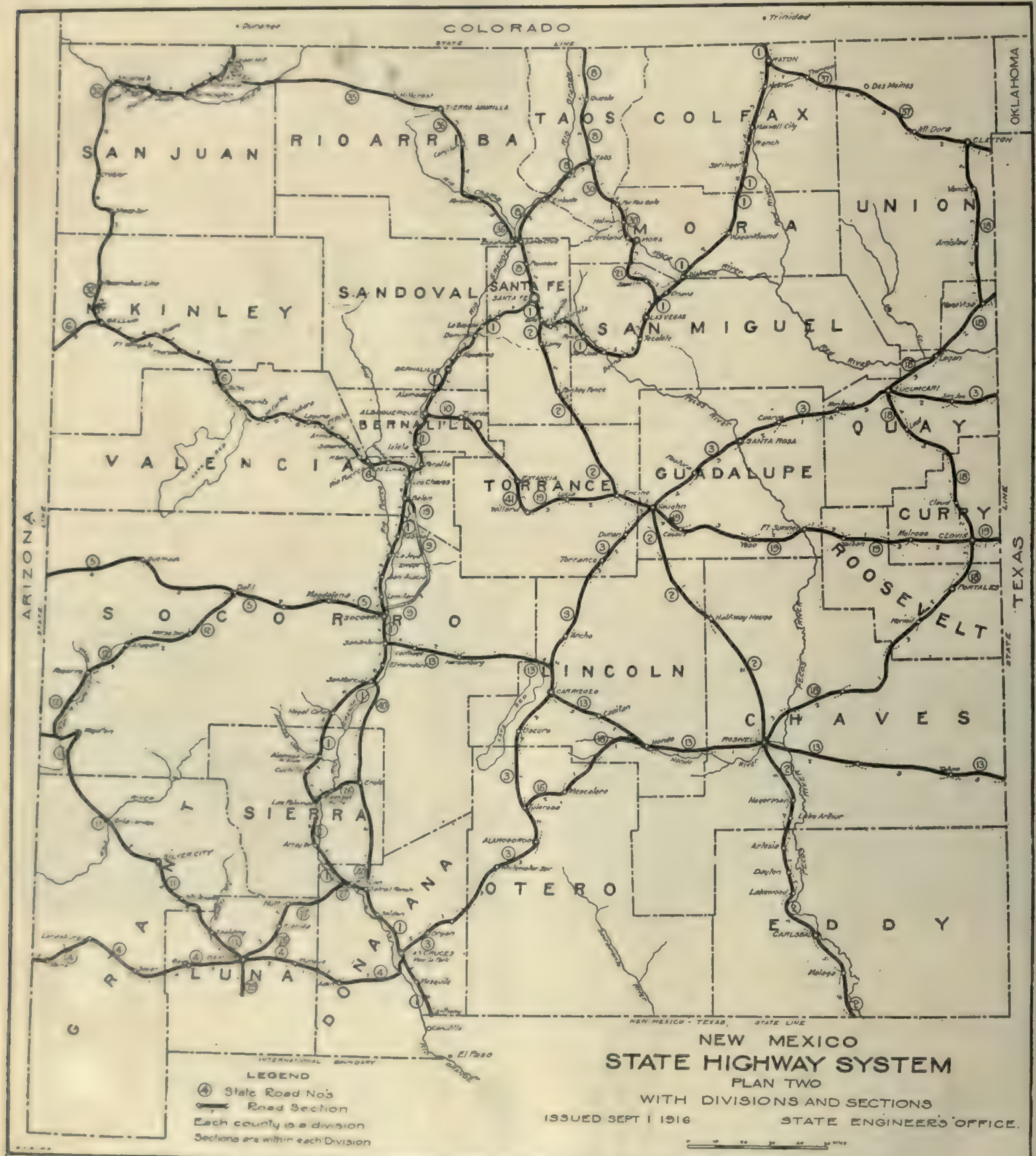
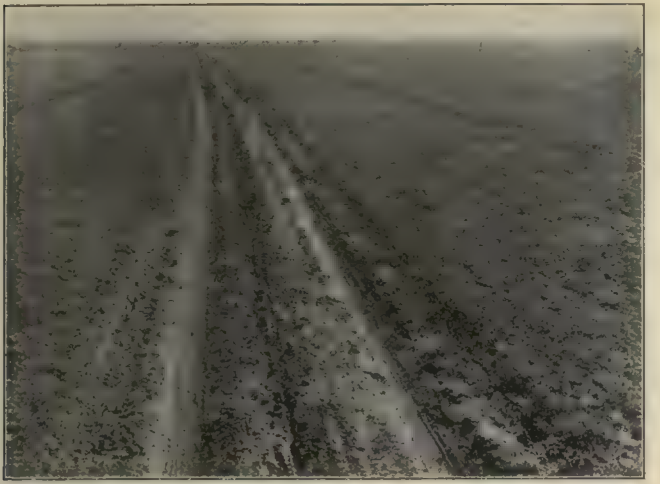
*State Engineer of New Mexico.



MAP OF NEW MEXICO—SHOWING THE STATE HIGHWAY SYSTEM.

In the construction of mountain roads, proper location, drainage and selection of the surfacing material are of the utmost importance. Improper location is expensive because of the unnecessary moving of material. Drainage is generally costly, but when properly designed requires little expenditure for maintenance. Materials for surfacing are generally found close to the work. Because of the class of traffic that the roads are planned to carry, good alignment must be secured and maximum grades must be established. Steep grades are easily destroyed by rains, and I believe that 6 per cent. should be a maximum except in rare instances. The maintenance of these roads should be constant during the year and performed preferably by the patrol system. There are 515 miles of mountain roads in the system.

Road construction in the valleys, and especially along the Rio Grande, is expensive, as is also maintenance. Consider-



A TYPICAL NEW MEXICO MESA ROAD.

SAND-CLAY ROAD IN NEW MEXICO SANDHILLS.

able hauling of material both for the roadbed and for surfacing is necessary, and drainage is expensive owing to the numerous irrigation ditches. In the Pecos Valley machine-graded roads have answered the purpose up to this time; but as traffic increases these roads will have to be surfaced. Owing to the greater population in the valleys and the increased weight and speed of traffic, both construction and maintenance costs are high. The mileage of valley roads included in the system is 515 miles.

Maintenance may be defined as work to prevent the roads from going to pieces and to keep them in the same condition as when first built. As a matter of fact, most of the maintenance of roads in this state during the first year might properly be considered as a part of the construction. When roads are built and the rainfall is depended upon for packing the earth and surfacing, there are times when the roads are hardly fit for travel for from six to ten months, owing to the irregularity of the rainfall. Without maintenance roads are destroyed so that more than maintenance—in fact, reconstruction—is required. Too often it has been called to the writer's attention that "Just a little work here and there will make a splendid road." This is one of the absurdities often suggested in road construction, for unless a road is built along well-known theoretical lines the result will be a road not worth while—one that cannot be economically maintained. Properly directed maintenance keeps a well built road in working order for the purpose for which it was intended, and in the proper design of a road economical maintenance must be provided for. The road drag is the most economical method of maintenance for all dirt roads and most types of gravel roads. The maintenance of state roads so far built in New Mexico has been turned over to the counties and, in some instances, the county authorities have taken considerable pride in keeping the roads in condition. In other counties absolutely no assistance has been given, and in these cases the state has sent in small repair and maintenance crews at the proper time to do the work. The organization of patrols by the state for certain types of roads will no doubt be the solution of the maintenance problem for three-fourths of the present proposed mileage as the mileage increases and becomes contiguous. The mileage which would have to be maintained and the cost would be as follows:

Mesa roads,	2,510 miles	at $25 per mile...........	$62,750
Mountain roads,	515 "	" $40 " "	20,600
Valley roads	515 "	" $50 " "	25,750
Total.........	3,540 miles		$109,100

The present annual income of the state road fund will take care of this. I might suggest, as a plan to be worked out later, the utilization of small crews of convicts to patrol certain roads in certain areas, five men to a crew being sufficient. This would provide for the greater part of the maintenance, costing $60,000 annually, and the remainder of the $109,100, approximately $49,000 annually, could be used under the deputy system.

Under the proposed plan of road improvement it will be necessary to construct a total of 3,540 miles of road within the next five years. The estimated costs of construction are as follows:

Mesa roads.	2,510 miles........................	$2,980,250
Mountain roads.	515 "	1,215,000
Valley roads.	515 "	1,274,000
Total..........	3,540 miles	$5,469,250

A CONCRETE PAVEMENT ON A STATE ROAD LEADING INTO SANTA FE, NEW MEXICO.

AN UNROLLED 9-IN GRAVEL ROAD IN BERNALILLO COUNTY, NEW MEXICO.

A CONCRETE OVERFLOW FLOORING IN NEW MEXICO.

We have under our present laws for financing road work the income from the 1-mill levy which, during the next five years, will produce $100,000 annually. From this must be deducted the interest and sinking fund for the 1913 bond issue for this period, which would give us a total of approximately $34,000. From the delinquent tax prior to 1910, some small return may be expected, but will not enter into this estimate. One-half of the total revenue derived by the state from automobile licenses now brings into the state fund approximately $25,000 annually and will undoubtedly average $35,000 annually during the next five years, making a total of $175,000 for the period. The law in regard to this should, I believe, be changed so as to give the entire fund to the state road system. This would give an income during the 5-year period of $350,000. The one-half of the 25 per cent. of the forest apportionment to the counties receiving such apportionment is estimated at $22,000 annually, or $110,000 for the period. This money is expended by the state on state roads situated in the counties from which the money is derived.

In two counties, Dona Ana and Luna, bond issues have been made. In Dona Ana County the issue amounted to $150,000, and has been expended. In Luna County the issue was $100,000, to be expended in installments of $25,000 per year. To the present, $25,000 has been expended.

The idea of bond issues for road work is objectionable to many, especially if the bonds run for long terms. The objection put forward is that for some thirty years a community is paying for roads that have disappeared. This is not the fact and the condition here. This is just the beginning of an era of road building. As an example, the case of Dona Ana County may be cited. Had the county not made the bond issue it would now be impossible to travel in the farming country. As it is, the county has good roads, and I believe more bonds would be voted to continue the work if the county had not already issued all that it may under the statutes. The roads that have been built are not going to be destroyed. The surface will wear off and must be replaced continually, but the foundation will remain and can be used for the hard-surfaced roads that will soon have to come in that county. Under the conditions existing before the roads were improved, the cost to the county in traffic for the next six or eight years would have been enormous. I am opposed to the issue of long-term bonds for surfacing a road which may have to be replaced in five, ten or fifteen years, but favor long-term bonds for building grades, foundations and structures—parts of the highway that are permanent improvements. In the older states where graded roads have been in existence for years, the issue of long-term bonds for short-lived surfaces is objectionable, but this condition does not exist in New Mexico. We must have bond issues to build the foundations and annual taxation to care for the surfacing.

STEEL HIGHWAY BRIDGE OVER THE GILA RIVER ON STATE ROAD NO. 11.

It is estimated that the cost of building the system as outlined will be $5,469,250. If from this is deducted the cost of the work already done, approximately $1,000,000, the estimated cost of the work yet to be done is about $4,500,000. To meet this amount the state funds as previously outlined will yield about $800,000 during the next five years. The apportionment from the federal aid funds will amount to $1,170,000, which must be met with an equal amount of state funds. This means that the state funds will have to be increased by $370,000 during the next five years. This must be done by an increase in taxes, by subscriptions and by county donations or bond issues. The Forest Service fund for road work is $42,000 annually for ten years, or $210,000 for the next five years. In this manner we can raise money as follows:

Federal aid	$1,170,000
State money to meet federal aid	1,170,000
Forest apportionment	210,000
Unexpended portion of 1913 bond issue	250,000
Total	$2,800,000

Taking this total from the estimated amount needed to complete the system leaves a balance of $1,700,000, to which must be added $370,000 to make up the amount the state must raise to meet the federal apportionment. In other words, the state must raise $2,070,000 in addition to her present sources of income to complete the system of roads within the next five years.

Under the administration of the present State Highway Commission—from July, 1912, to October, 1916—the construction of bridges over streams and arroyos has been carried on energetically. This has been done by cooperation between the commission and the counties, especially in the construction of the larger and more expensive structures. All bridges paid for by the counties, with one or two exceptions, have been designed by and built under the direction of the State Engineer. During this period there has been expended $280,000 for the construction of 22 steel bridges with concrete piers and abutments, 57 pile bent bridges, 3 reinforced concrete slab bridges, and 16 concrete floorings across arroyos. At the present writing 18 pile bent bridges, 4 steel bridges and 2 concrete floorings are under construction.

During the same period there have been built by the state 705 miles of the three classes of roads previously referred to. The expenditures by the state, with county donations, for this work have amounted to about $850,000.

The program for road building in 1917 cannot be stated at this time, as the legislature meets in January, and it is hoped that a larger appropriation will be made than has been made in the past.

Road Betterment in Oklahoma

BY W. P. DANFORD* AND C. W. SHANNON†

Oklahoma, admitted as the 46th state in the Union on November 16, 1907, is situated a little south of the geographical center of the country and has an area of 70,470 square miles. The elevations above sea level vary from about 400 ft. in the southeastern portion to about 5,000 ft. in the extreme northwestern part of the "Panhandle," the character of the surface varying from rugged mountain regions with limestone and granite peaks, partly timbered and partly barren, to rolling uplands and the high prairie plains.

Climatic Conditions

The climatic conditions in the state are varied and are subject to frequent and rapid changes. In general the humidity decreases from east to west, the greater part of the state being in the humid region though the extreme western part and the "Panhandle" are semi-arid. The rainfall varies from year to year and from season to season, and, in general, steadily decreases from east to west. The average rainfall is from 34 to 45 ins. in the eastern part; from 30 to 40 ins. in the central part, and from 15 to 30 ins. in the western portion.

A 30-FT. CONCRETE ARCH BRIDGE IN McINTOSH COUNTY, OKLAHOMA—BUILT ACCORDING TO HIGHWAY DEPARTMENT STANDARD PLANS.

Winter conditions are sometimes severe, but there are no long periods of continuous freezing and thawing. Snow rarely falls in the southeastern part of the state, and rarely in the central part. In central and western Oklahoma winter blizzards are common. There is often considerable rainfall during the winter months so that road conditions are frequently very bad.

There is much windy weather throughout the year. This is detrimental to roads in the dry season, but, on the other hand, aids materially in drying the roads after rains.

Temperature changes range from about 0° to 110° F. However, neither extreme condition lasts for more than a few days and for the greater part of the year the temperature is mild, except for the occasional occurrence of peculiar climatic conditions known as "northers" when high winds prevail and sudden drops in temperature occur.

In general, climatic conditions are good, but the likelihood of sudden changes has to be taken into consideration in planning for road work.

Topography

Topographically, the state is divided into the nine regions shown in the accompanying sketch map as follows: Ozark region, Sandstone Hills region, Ouachita Mountain region, Coastal Plains region, Arbuckle Mountain region, Redbeds Plains region, Wichita Mountain region, Gypsum Hills region and High Plains region. These are not sharply defined, and very nearly coincide with the geological divisions of the state. The great variety of rocks found in different parts of the state produces types of topography greatly differing in character. The western half of Oklahoma, with the exception of the Gypsum Hills region and the Wichita Mountains, is a flat or rolling prairie. The surface materials vary from red shales and sandstones to loose sands and the compact granites and clays of the High Plains, a region widely noted for its excellent natural roads. In the southern and eastern part of the state there is much level land, and also much rugged and hilly land.

The Ouachita, Arbuckle, and Wichita Mountains present the most rugged topography, yet in part of the Sandstone Hills region the country is very rough. The Ozark region, while designated as mountainous, is, in fact, an elevated tableland in which excellent roadways can readily be laid out. The only very rough areas are encountered where the uplands descend abruptly to the stream valleys. Even in the rougher parts of the state the topography is such that desirable roadways may be located by following sinuous routes along the streams and among the hills. The Ouachita region of the southeastern part of the state presents the most difficult problems.

A LOW-LEVEL CONCRETE CROSSING ON THE JEFFERSON HIGHWAY IN ATOKA COUNTY, OKLAHOMA—BUILT BY STATE CONVICTS.

Geology

The rocks of the state have been divided into a number of geologic provinces which, with their locations and characteristics are, briefly, as follows:

The Pennsylvanian region is situated in the north and east central portion of the state, corresponding very closely to the area designed on the topographic map as the Sandstone Hills region. It is divided, according to the lithologic character of the rocks, into two subdivisions, the first comprising an area north of the Arkansas River in which there are beds of limestone widely distributed over the section with sandstones and shales over much of the area. The other comprises an area south of the Arkansas in which the rocks, except in the northern portion where there are some limestones, are chiefly sandstones and shales.

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*Assistant State Engineer of Oklahoma.

†Director, State Geological Survey of Oklahoma.

The Pennsylvanian-Cretaceous region is situated south of the Arbuckle and Wichita Mountains. Sand and sandstones occur throughout the area and there are small limestone beds and local deposits of gravel conglomerate.

The Cretaceous region is situated south and east of the Arbuckle Mountain region, and between the Arbuckle and Ouachita Mountains on the north and the Red River on the south. The central part of this region contains several beds of limestone while the northern and southern parts contain sand and soft sandstones. This and the Pennsylvanian-Cretaceous region correspond very closely to the area designated on the topographic map as the Coastal Plains region.

The Permian region occupies most of the central and western portions of the state except the "Panhandle." The rocks in this province are divided into the Non-Red Permian, occurring chiefly in Kay County and consisting of limestone, sandstones and shales, and the Red Permian occupying all of the western portion of the state, except where it is overlaid by younger rocks, and consisting of sandstone, shales, gypsum and dolomitic limestone. The Permian region corresponds very closely to the area designated on the topographic map as the Redbeds Plains region.

The Wichita and the Arbuckle Mountain regions abound in granite, limestone and gravel.

The Ozark Mountain or Mississippian region is situated in the north central part of the state, and is well supplied with limestone and chert over the entire area.

The Ouachita Mountain region in the southeastern part of the state has numerous deposits of asphalt as well as frequent beds of sandstones and shales.

Road Building Material

In practically all of these sections are materials which are available for road building. Among the more important are the various limestones, the gravel, consisting of disintegrated granite and limestone, in the Wichita Mountain region, the granite, limestone, gravel and asphalt in the Arbuckle Mountain region, and the cherts and asphalts.

The choice of material for road building in Oklahoma depends largely on its accessibility. There are three kinds of gravel in the state, viz., granite, quartz and limestone gravel. They have only fair wearing qualities, but have good cementing value and form smooth, hard road surfaces. Asphalts occur plentifully in the state, largely as impregnations in limestone and sandstone. Rock asphalt, a physical combination of pure asphalt and rock, has been used successfully, and asphaltic oils have been used in some localities. Near the coal mines, clinker, the product left after the burning of culm piles, has been used to some extent. Because of its softness it is not suited for use under heavy traffic.

The limestones form an unlimited supply of road material. They have been quarried in many places but have been used chiefly for railroad ballast, for concrete work, and for the manufacture of Portland cement. Near the lead and zinc mines, a material known as "mill tailings," or "chats," consisting principally of chert or limestone mined with lead and zinc and crushed into varying degrees of fineness by the milling process, may be used to advantage. The mine operators are anxious to get rid of the material and it may be loaded on cars at a cost of 6 or 8 cts. a ton.

Road Laws and Administration Methods

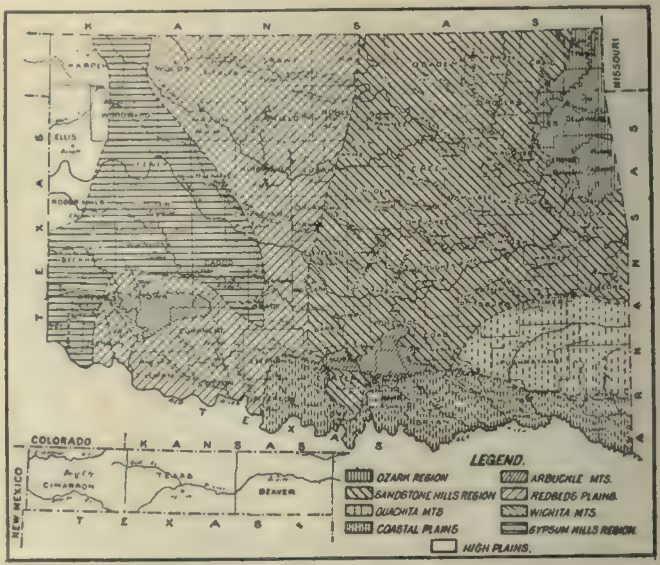
The highway law of Oklahoma is based on the theory that, given the funds, it takes system and intelligent supervision to construct good roads.

In 1915, the legislature, after considerable investigation of the laws governing road work in other states, passed a law creating the State Department of Highways and specifying the procedure for the construction and maintenance of roads and bridges. This law was amended at a special session of the legislature in 1916 and it is to be hoped that in the future, as time develops the weak points, it will be further perfected.

The Department of Highways is controlled by one commissioner who is appointed by the governor, subject to the approval of the senate. The Commissioner of Highways may, with the approval of the governor, appoint a state engineer, an assistant state engineer and one bookkeeper and cashier. Additional help is employed, as needed, out of the funds provided for the maintenance of the department, the registration of motor vehicles being in charge of a chief clerk.

Plans, profiles and estimates for state road and bridge work for township roads built with the proceeds of bond issues, for bridges, on township roads, over 20-ft. span built from tax levies, and for roads built with federal aid, must be approved by the department.

Provision is made for two classes of roads—state roads and township roads. State roads, as first designated, consist of from 10 to 15 per cent. of the main traveled roads of each county. These roads must connect the principal market points and be located with reference to continuity, cost of construction and maintenance; and it is intended that they shall lead continuously from county to county throughout the state. All other roads are known as township roads. It is provided that after the roads in the state road system in a county have been designated they must be constructed complete and placed in condition to be dragged (if of earth) before more mileage may be added from the township road system. The state road system in each county is designated by the board of county commissioners, consisting of three elected members, and it is subject to the approval of the Department of Highways. No changes can be made in the alignment of state roads by the department, however, unless a personal investigation has first been made on the ground.



SKETCH MAP OF OKLAHOMA, SHOWING THE NINE TOPOGRAPHICAL DIVISIONS.

The Department of Highways must also furnish standard plans for bridges, collect statistics relative to the construction of roads and perform many other duties, including the collection of automobile license fees and the placing of tags on all motor vehicles in the state.

The county commissioners of each county must appoint a county engineer who must first have passed an examination under the supervision of the Department of Highways and secured a certificate of competency authorizing him to act.

The examinations are conducted by three disinterested civil engineers of established reputation who are appointed by the Commissioner of Highways and act as a board of examiners. A duly qualified engineer may serve more than one county as county engineer.

All road and bridge work coming under the control of the Department of Highways, including maintenance, is under the direct supervision of the county engineers. A county voting bonds for road construction (county bond issues being made for hard-surfaced roads only) may appoint a consulting engineer, such appointment and the compensation being subject to the approval of the Department of Highways. Townships may vote bonds for the construction of earth roads, in which case the work is under the direct supervision of the county engineer.

State roads may also be built with state convict labor. Application for the use of state convicts must be made to the State Board of Public Affairs through the Commissioner of Highways. When the application is approved by the commissioner, and plans, profiles and specifications for the work have been approved by the department, the Board of Affairs is authorized to enter into an agreement with the county commissioners for the furnishing of convicts, teams and equipment. The county using the convicts bears the cost of transportation and pays the difference in cost of feeding the convicts in the penitentiary and out on the road.

Regular Sources of Revenue for County Road Work

Outside of public and private subscriptions, bond issues, the gross production tax, and federal aid, each county has five funds that are used for the construction and maintenance of roads and bridges. These are as follows:

(1) The county road construction fund is used for the construction of state roads within the county, and for the purchase of equipment and material. This fund is usually a ¼-mill levy, but may be more. The limit of taxation in a county is from 4 to 6 mills, according to the assessed valuation, but counties may levy up to 8 mills, provided the excess is used for the construction of roads.

(2) The state highway construction fund is also used for the purchase of equipment and material and for the construction of state roads only. This is a ¼-mill levy made by the state on all property subject to taxation within the state. The tax is collected in the various counties, remitted to the state treasurer, and disbursed to the various counties by the Commissioner of Highways. Counties making application for the amount of money to their credit in this fund must show in such application that the county has made at least a ¼-mill levy, and that it has been or will be expended on state roads, under the direction of the county engineer and according to plans and profiles approved by the Department of Highways. They must also name the state roads that they intend to improve with the state highway construction fund and certify that plans, profiles and estimates for the work have been submitted to and approved by the Department of Highways.

(3) The state road maintenance fund is derived from fines. It is usually a small fund and is used to assist in the maintenance of state roads within the counties in which collected.

(4) The road and bridge fund is used "for the construction and maintenance of county bridges, and the opening and changing of roads (exclusive of grading) and the purchase and condemnation of right of way for roads."

(5) The county road maintenance fund (so called to distinguish it from the state road maintenance fund) is the fund derived from the registration of motor vehicles and is used for the maintenance of state roads only, except that, if at the end of the fiscal year all constructed state roads have been properly maintained, the balance remaining in the fund may be transferred to the construction fund.

The tax collected by the department on motor vehicles is based on the rated horse power and is as follows: First year 50 cts. per H.P., second year 40 cts., third year 30 cts., and each year thereafter 20 cts. per H.P. The amount of money being collected from this source has, to the great satisfaction of the department and the counties receiving the benefit, increased to a sum beyond the most liberal estimate previously made. The department was organized and began its work July 1, 1915. During the last half of that year about 26,000 automobiles were registered and the number of motorcycles and traction engines brought the total up to about 27,000, the amount of money derived being about $153,000. During ten months of 1916 approximately 50,000 automobiles alone have been registered and over $500,000 has been collected, not including about $20,000 additional that has been collected on delinquents who escaped registration in 1915. The department has, at present, four men in the field to enforce the collection of this tax. The fine for operating a car on the road without a state tag is not less than $50 and costs. Of the amount of money collected from motor vehicle owners, 90 per cent. is returned, monthly, by the department to the counties in which collected, and 10 per cent. is remitted to the state treasurer and placed in the general revenue fund. The amount remitted to the state has been more than double the expenses of the department, including engineering expenses.

Other Sources of Revenue for County Road Work

A great deal of work is accomplished in the various counties from time to time through the aid of public and private donations in the form of either time or money. Frequently a town will set aside a day on which each place of business will close and every able-bodied citizen will donate his services on a certain road under the supervision of a capable foreman or engineer.

Practically every one who reads is now more or less familiar with the plan for federal aid in the building of roads. Plans for the utilization of this fund are now under way and it is expected that active work will begin in Oklahoma during 1917.

The gross production tax is a tax levied on all oil, gas or minerals produced within the state. It is paid to the state auditor and is disbursed by him as follows:

Two-thirds of the amount collected is remitted to the state treasurer and is credited to the general revenue fund for the state and applied to the current expenses of the state government.

One-third of the amount collected is remitted to the county treasurer of the county where the oil, gas or mineral is produced. One-half of this amount is placed in the common school fund and one-half in the road and bridge fund of the county. The latter amount is available for use in the construction of permanent roads only—permanent roads being defined by law as hard-surfaced roads. Besides the vast mineral resources of the state, some of the largest oil fields in the world are situated in Oklahoma. Consequently some of the counties in this state will have a decided advantage in school facilities and in the construction of permanent roads.

A law permitting counties to vote bonds for hard-surfaced roads was passed at the special session of the legislature in January, 1916. At this writing no counties have voted bonds for this purpose, but several issues, aggregating at least $3,000,000, are contemplated for the near future and will no doubt be voted.

Many townships have voted bonds for the construction of bridges and earth roads. Under the law, as amended in 1916, a township board may extend a part of its funds on state roads within the township, under the direction of the county commissioners and engineer. Many miles of state roads have been constructed in this manner.

Results Accomplished Since the Highway Law Took Effect

The State Department of Highways is now fully organized except as to the office of State Engineer, which so far has been handicapped by a lack of funds to enable it to properly handle all the duties imposed upon it. A state road system has been designated in each of the 77 counties of the state, the mileage amounting to about 14,000. Work is being concentrated on this mileage with the result that on September 1, 1916, when the department prepared a map of the state showing the state roads, complete reports from all counties showed that the earth work and bridge and culvert construction on approximately 5,000 of the 14,000 miles of state roads had been practically completed. A few miles are now being hard-surfaced.

Many proposed "national" highways pass through the state and at least three of these have assumed tangible form and will soon be finally located and later hard-surfaced. The three mentioned are the Ozark Trail, the Oklahoma, Texas and Gulf Highway, and the Jefferson Highway.

Under the direction of the department, 129 applicants have been examined for the position of county engineer. Of these, 51 have received permanent certificates of competency. Examinations are written and consume two days.

Besides the work in connection with the registration of motor vehicles, which is an enormous task, the department has prepared and issued in printed loose-leaf form (pocket size) complete instructions to the county engineers. There have also been prepared 14 different forms of records for the use of the county officials, standard plans for concrete culverts and bridges and numerous other data.

Eight crews of state convicts—a total of more than 200 prisoners—are now at work on the state roads and about that many more will soon be sent out. Of the convicts now working, five crews are at work on the Jefferson Highway.

Because of the new highway law, more miles of roads have been graded and more permanent culverts and bridges constructed in the past sixteen months in Oklahoma than in the entire time previous since statehood was granted in 1907, and the era of road building has just commenced. The prospects are that the next five years will see hundreds of miles of hard-surfaced permanent roads constructed throughout the state.

The Destruction of New York City Pavements by Unusual Traffic

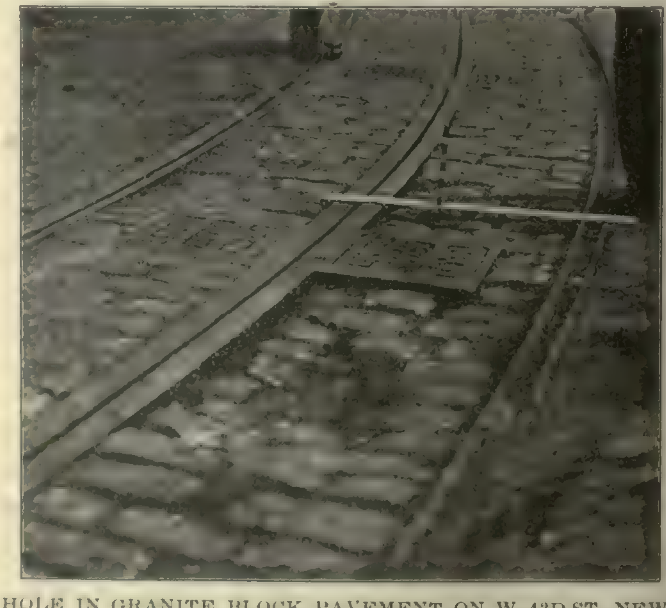
A great deal of damage has been done during the past year to some of the best pavements in Manhattan Borough, New York City, according to Eugene W. Stern, Chief Engineer in Charge of Highways in that borough. Mr. Stern's description of the damage and of the traffic causing it was contained in a paper entitled "Necessity for Limiting the Loads, Size and Speed of Vehicles," presented at the recent convention of the American Society of Municipal Improvements at Newark, N. J. The data in the following paragraphs are taken from that paper.

A contractor engaged in the construction of a part of the new subway system of New York City has employed tractor and trailer outfits to haul excavated material from various points on Broadway near 42nd St. to the North River, the route followed being over W. 42nd St. to 10th Ave., thence over 10th Ave. to W. 50th St. and thence over W. 50th St. to the river. The hauling unit, of which 10 have been operated, consists of a 4-wheeled tractor with rubber tires and a 2-wheeled platform trailer with steel tires. One of these units is shown in an accompanying illustration. The principal dimensions of the trailer are as follows: Platform, over all, 22.2 ft. long by 8.6 ft. wide; wheel base, 11.5 ft.; tread, 6.55 ft.; wheels, 41 ins. in diameter and 8½ ins. wide.; springs, 53 ins. long made up of 20 leaves, ½ in. thick by 3½ ins. wide. The over all length of the tractor and trailer is 33 ft. The rear wheels of the tractor are 42 ins. in diameter and are equipped with double 6-in. rubber tires.

When fully loaded one of these outfits carries six skips, each of which, loaded, weighs from 2½ to 3 tons. There are, or were, 10 of the outfits in operation, each being in use 16 hours a day. As an hour was required for a round trip, the total number of round trips a day for the 10 outfits was 160. The tractors and trailers were run at a speed of about 6 miles an hour during the day and at 12 or 14 miles an hour at night.

The age and character of the pavements along the route

HOLE IN GRANITE BLOCK PAVEMENT ON W. 42D ST.—
YORK CITY—RESULT OF UNUSUALLY HEAVY TRAFFIC
IN CONNECTION WITH SUBWAY CONSTRUCTION.



HOLE IN GRANITE BLOCK PAVEMENT ON W. 42D ST., NEW
CAUSED BY SAME VEHICLES RESPONSIBLE FOR CONDITION SHOWN IN ILLUSTRATION OPPOSITE.

TRACTOR AND TRAILER USED FOR HAULING MATERIAL EXCAVATED IN NEW YORK SUBWAY WORK—SHOWING EXCESSIVE LOAD ON TRAILER.

traversed are as follows: 42d St., between 8th and 9th Aves., sheet asphalt on a concrete foundation, completed in July, 1912; 42d St., between 9th and 10th Aves., improved granite block on a concrete foundation, completed in November, 1912; 10th Ave., between 42d and 50th Sts., improved granite block on a concrete foundation, completed in Feb., 1913; 50th St., between 10th and 11th Aves., sheet asphalt on a concrete foundation, completed in Aug., 1912; 50th St., between 11th and 12th Aves., improved granite block on a concrete foundation, completed in May, 1912. All these are about four years old and are considered among the best in Manhattan.

Up to the time the tractors and trailers began to be operated the pavements had shown no greater wear than might be expected on streets carrying the heavy traffic that these are called upon to carry. The average yearly maintenance costs had been about $150 for the granite and $70 for the sheet asphalt. In a period of about nine months during which the tractors and trailers have been operated the repairs on the granite have amounted to about 5,400 sq. yds. (about 32 per cent. of the area), costing $6,000, and 1,900 sq. yds. on the sheet asphalt (about 30 per cent. of the area), costing $1,900.

The effects of the traffic on some of the pavement along the route are shown in the accompanying illustrations. In some cases granite paving blocks have been crushed and ground to powder; in other cases they have been split. While the granite in these pavements is not of a kind that might be called "hard," it is a stone that has been used satisfactorily in the best types of pavements in New York City. It was quarried at North Jay, Me., Rockport, Mass., and Salisbury, N. C.

On sheet asphalt pavements the destructive effect has been equally marked. The surfacing has been ground up fine in places and has been broken and cracked in others. It has also been shoved out of place and shows many depressions, waves and ruts.

Operation of the Municipal Asphalt Plant at St. Louis, Missouri*

The City of St. Louis contracted in 1911 with Warren Brothers, of Boston, for the erection of an asphalt plant. The cost of the superstructure was approximately $20,000. Additions have been made at various times until today the value of the plant, real estate and equipment is placed at $48,000, which is a conservative figure.

The organization consists of: Engineer in charge, general foreman, plant foreman, one chemist and assistant, one clerk at plant and two in office, fifteen foremen, 100 to 125 men of various classes.

During last year the plant output amounted to: 231,020 cu. ft. top, equals 160,157 sq. yds.; 83,751 cu. ft. binder, equals 75,519 sq. yds.

The costs for repairs and maintenance are approximately as follows:

Maintenance per sq. yd. per annum, 9 cts., including
Straight burner resurfacing (plant mix).....60 cts. per sq. yd.
Straight patching wear and tear (plant mix).81 " " " "
Straight flush coating on bituminous roads.. 2½ " " " "
There are 2,056,228 sq. yds. under city maintenance
904,115 " " " contract maintenance
2,960,343 total yardage.

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*From a paper entitled "The Maintenance of Sheet Pavements," read by Julius L. Laxton, Engineer of Bituminous Roadways, Department of Streets and Sewers, St. Louis, Mo., before a recent meeting of the Engineers' Club of St. Louis, and printed in the "Journal" of that organization.

EFFECT OF EXCESSIVE LOADS ON SHEET ASPHALT PAVEMENT ON 50TH ST. WEST OF 9TH AVE., NEW YORK CITY.

SURFACE VIEW OF SHEET ASPHALT PAVEMENT ON 50TH ST. WEST OF 10TH AVE.—SHOWING EFFECT OF EXCESSIVE LOADS.

The Highway System as a Military Adjunct

An illuminating discussion of highways from a military point of view, with especial reference to their use in defensive operations, appeared in a recent paper entitled "The Value of An Adequate Highway System as a Military Adjunct." The paper was written by Capt. Arthur P. S. Hyde, C. A. C., U. S. A., and was presented by him at the fall convention of the Washington County Engineers' Association at Tacoma, Wash

To one unfamiliar with military operations it would probably seem that the most frequent service rendered by troops would be fighting, but Capt. Hyde points out that this view is erroneous, that as a matter of fact marching is the most frequent work. Continuing, Capt. Hyde says:

"All maneuvering for position, in fact all progress of the campaign involves the movement of troops from one place to another and consequently the necessity for adequate means of communication. In a word, a proper highway system is most necessary. Not only must troops be moved about with all their accompanying trains and impedimenta, but also the question of supply, involving the transportation of ammunition, food, medical stores and other items which are absolutely essential to the conduct of campaigns, as well as the carrying of the wounded to the rear, makes necessary the maintenance of proper means of communication. It is a foregone conclusion that these means of communication, involving the construction of railways and permanent highways cannot be left until the outbreak of a war, but must be provided in time of peace. Such means of communication resolve themselves, naturally, into three classes, viz.: railway lines, lines of water communication and highways. Troops and supplies are transported over water and rail lines as far as circumstances will permit, but in any theater of operations under any conditions of warfare there is a point known as the railhead, beyond which it is impossible to continue rail transport. Similarily there is a place where water transport comes to an end. These are the points where dependence must be had upon the highways. If the highways of the theater of operations are well constructed, and of a permanent type, a tremendous advantage is thereby assured to the military forces. Under the most favorable circumstances there are bound to be delays, breakdowns and other kinds of confusion, and if to these are added conditions which today confront our transportation service in Mexico, the entire army is bound to suffer and the results of the campaign be largely interfered with.

"As an instance of the effectiveness of an excellent system of highways, we have but to look at the history of the first few weeks of the present war in Europe. The rapidity of the German advance was such as to astound, not only the general public, but military experts as well. The average rate of advance of large bodies of troops composed of all arms of the service seldom exceeds twelve to fifteen miles a day, yet during these first few weeks, the German army advanced, including time spent in fighting, at the rate of twenty-five to thirty-five miles every day.

"How was this accomplished? It was indeed puzzling until it finally became known that the troops were being transported in motor vehicles of various kinds. Not only was the rapidity of the advance greatly increased, but also when the troops were brought to a position where an engagement was to be fought, they were vastly fresher than had they proceeded by marching. The Allies, quickly appreciating the tremendous advantage of the Germans, mobilized as rapidly as possible all such motor transportation as they were able to get hold of, and their troops were similarly rushed to the front over the splendid highways of France, Flanders and Belgium, where London motor buses became quite a common sight.

"On the other hand look at the experiences of our army during the past few months in Mexico. When the punitive expedition under General Pershing was sent over the border early last spring and the use of the Mexican railroads was denied our troops by the de facto government of Mexico, it became necessary to supply the entire force by means of motor transportation. As long as the weather conditions remained favorable this was not a serious undertaking, although the distance to be traversed by the motor truck trains was several hundred miles in extent. In that part of Mexico, however, the summer is the rainy season, and the soil, when it becomes thoroughly soaked, takes on a plastic consistency that seems bottomless. In an effort to find ground that was dry and hard enough to support the motor trucks, the roads have been greatly widened, and now in many places, they are as much as a mile in width, and the very greatest of difficulty has been experienced in getting supplies through to their destination. So serious has this condition proven that efforts have been confined to getting through only the most essential articles and the troops have been actually upon short rations.

"The value of a permanent system of highways as a military adjunct can be treated from two different points of view: First the maneuvering of troops themselves and second the transportation of supplies. The experience of both the Germans and Allies above referred to demonstrates clearly what will unquestionably be the practice in future campaigns, viz: the transporting of troops by motor trucks.

"The value of cavalry lies generally in its mobility. The cavalryman is armed with a rifle just like the infantryman and is able to fight on foot quite as efficiently as the dismounted soldier; but he has the advantage of being able to get from one place to another with greater speed and less fatigue. Hence the necessity for a force of cavalry with every division. With this new use of motor transportation, an even greater mobility is assured to our troops than by mounting them individually on horseback; the distances they can cover are considerably greater, and the fatigue involved on the part of the individual man is very much less. But to make use of this tremendous advantage there must be roads, and the roads must be good ones with a hard, smooth surface and good drainage.

"While a single trunk line of permanent highway is of immense advantage to troops advancing, yet a system of improved highways is of inestimable additional value. Troops marching on a single road take a long time to reach a given point and deploy. For example, a division consisting of approximately 20,000 troops of all arms of the service, with their wagon trains, requires more than 15 miles of road space; and a division is the smallest unit comprising all arms of the service. It is generally recognized the world over as the fighting unit.

"With a complete system of improved highways there would naturally be parallel roads which could be occupied, with frequent connecting roads for ready communication between the several columns, so that an army could advance from one line to another in considerably less time by utilizing parallel roads than by marching upon a single road.

"Turning now to the matter of supply, the transportation involved is divided into combat, field, ammunition, supply, sanitary and engineer trains. These are all absolutely necessary for keeping the commands to which they are attached ready for action at all times without hampering their freedom of movement.

"The combat train always marches with the troops to which it is attached. The field trains pertaining to a division are usually consolidated, marching immediately in the rear of the division. Supply, ammunition, sanitary and engineer trains generally move independently of the movements of the troops. Without going into minute details as to the technical handling of supplies, suffice it to say that an advance base is established at the railhead or at the point where water transportation is no longer possible. The supplies are then carried to the front by motor transport for distribution to the various organizations.

"It will thus appear that the highways must be of sufficient width to permit trains to move in opposite directions upon the same road. There will be going forward the various loaded trains containing supplies of all kinds, while returning, there will necessarily be, not only the empty trains but ambulances containing the sick and wounded. If the road is narrow, congestion cannot possibly be avoided in the passing of trains in different directions. In fact, congestion may easily result in confusion of the worst sort. As a matter of fact, it will be necessary at times for three vehicles to pass each other, as for example, trains moving in opposite directions and light cars and motorcycles or mounted couriers going to and from various points in the column.

"Since the trouble with Mexico became acute early last spring, the War Department has purchased hundreds of motor trucks. Until that time there was a considerable difference of opinion as to the relative value of mule-drawn wagons and motor-propelled trucks. For years the mule had been the faithful servant of the army, but the experience in Europe coupled with the failure of the de facto government of Mexico to permit the use of the railroads, determined the War Department to try on an extensive scale the experiment of handling all supplies from the base to the advancing troops by motor trucks.

"While the experiment has not proven entirely successful for the reasons above stated, yet it is unquestionably true that the motor truck as a means of military transportation has come to stay. While there will still be mule-drawn wagons accompanying the troops and being used for the distribution of supplies between various units, yet the connecting link between the army in campaign and the base of supplies at the railhead will unquestionably be largely by motor trucks."

A large part of Captain Hyde's paper was devoted to a description of the military works in the Puget Sound country and to the manner in which road improvement in that section should be carried out in order to coordinate the highway system with the government's coast defence plans. Referring in this discussion to the use of heavy mobile artillery, he says:

"One of the important lessons learned from the present war in Europe is the effectiveness of heavy mobile artillery. The world was astounded and at first very incredulous over the reports of the German 42-centimeter gun, a gun one-half inch greater in caliber than the great 16-inch gun at Panama, which is the largest coast defence weapon we have yet built. These 42-centimeter guns were transported with apparent ease from place to place and used with tremendous effect against the land forts on the French frontier. Other guns of great caliber that are being used in the field in Europe include the 11-in. howitzer, which resembles very much, both in appearance and its method of mounting, our own 12-in. seacoast mortar, and like the latter being used for high-angle fire. The use of these very heavy weapons is made possible by the splendid highway system of continental Europe.

"In the Dardanelles campaign it was discovered that the Turks, doubtless under the instruction and guidance of German coast artillery and engineer officers, were introducing a new system of emplacing of coast defense guns. The British would attack a certain battery and apparently silence it. The next day those same guns would open fire upon them from an entirely different place. In other words, coast defense guns instead of being permanently emplaced, as has been the rule in the past, were being transported from place to place and fired from concealment from the most unexpected locations.

"I am not prepared to say that the day of the fixed coast defense guns of our present system is past, but it is the undoubted sentiment among coast artillery officers in our service, that we must at least supplement our permanent ones with some suitable type of heavy mobile artillery. Whether these guns should be mounted on flat cars to be transported on a railroad, or by motor truck on the highways, is an open question. The latter method would unquestionably afford a greater degree of mobility, but in the present condition of our highway systems, it is almost impossible of attainment."

After further consideration of the defensive problems of the Puget Sound country, Captain Hyde concludes as follows:

"In conclusion I desire to say that one of the most important phases of real military preparedness that can possibly be undertaken, is that that is now going on under the impetus of the good roads movement now become so general all over the country. A good road, well built, well surfaced and well drained, may be of immense value from a military point of view anywhere, but here in our part of the country, we have the especial problem of coast defense to face. Therefore, in the location of roads, particularly along the shore, special attention to military requirements in the planning and laying out of a highway may prove to be of inestimable value at some time in the future when that highway becomes a military road. In the last analysis a highway system is not an adjunct to military operations, but is vital to them."

Earth Road Oiling in Iowa

Oiling an earth road can be considered only as a method of maintenance, according to a writer in the "Service Bulletin" of the Iowa State Highway Commission, this conclusion being based on experiments that have been made. It is stated that, properly applied on a well-graded roadbed in proper condition to receive the application and subject to comparatively light traffic, oil is a splendid more or less temporary dust and mud preventive, but it does not add greatly to the ability of the road to resist wear.

Every experiment so far made in Iowa, it is stated, indicates that to secure the desired results at least one application, and sometimes two, must be made each year. Heavy traffic on an oiled earth road will break up the oil-soaked earth and leave a mat of fine particles on the surface. There will be less of this fine material than there is on a road of the same kind that has not been oiled, however, and the oil will keep most of the material on the road and prevent the rising of dust clouds.

Through short periods of storm, according to the article referred to, the oil will prevent the formation of mud. During the spring break-up the oiled earth road is given its most severe test, and its behavior at that time depends on the traffic it has to carry and the drainage conditions. If water stands in the ditches the roadbed will be saturated and the alternate freezing and thawing will add to the adverse conditions the oil has to overcome. These conditions will be made worse if the road is rutted or has holes in which water can stand. If water gets into the roadbed, and if in this condition the road has to carry heavy traffic, mud will be formed and the treated material at the top will be mixed with the untreated earth below. Then when the road dries out the material at the top will contain a large proportion of untreated material, and another application of oil will be required.

The Treatment of Wood Paving Blocks*

By CLYDE H. TEESDALE†

The results of the experiments made at the Forest Products Laboratory have led to the following conclusions concerning the selection of timber, oil, treatment and laying of wood block paving, made from southern yellow pine. These conclusions must be considered tentative, at least for the present, until greater experience with these methods has been obtained.

1. Woods.—It is preferable to use green timber, although seasoned stock may be used by proper handling. The advantage of using green stock is the greater certainty of having the blocks expanded to their maximum size when they are laid in the street. Green timber also requires a thorough steaming before it is in a suitable condition for receiving the oil, and, hence, there is less incentive for omitting this portion of the treatment. Rapid-growth blocks are undesirable, not only from the point of view of subsequent durability of the pavement, but also because they take an inferior treatment and appear to bleed more than those which are of slow growth. Rapid-growth heart pine takes good treatment in the summer wood bands but the spring wood bands are liable to have very poor penetrations. If the blocks are of very rapid growth this results in considerable areas which are untreated. This is not only undesirable because their durability is questioned, but also because such blocks are more liable to take up water and expand.

2. Preservatives.—Dry blocks treated with either creosote or with tar and creosote mixtures will take up water and expand. The main function of the oil, therefore, is not to waterproof the blocks, but to preserve them from decay. Any fairly good grade of oil which will permanently accomplish this purpose and which can be thoroughly diffused through the wood should prove satisfactory. When tar mixtures are used the tars selected from those produced at low temperatures and containing small amounts of free carbon have given the best penetrations. Preferably the free carbon should be removed. Too much tar in the mixtures is not desirable if the best penetrations are to be expected. It has been found that bleeding may occur with oils having widely differing properties, and that by proper methods of treatment the bleeding may be greatly reduced. The method of treatment is therefore of greater importance than the oil when considering the bleeding problem, as this may be handled in the treatment specifications. However, it should be borne in mind that if any bleeding occurs the presence of a tar paving oil on the pavement is more objectionable than an equal amount of creosote, because of its sticky and adhesive character.

3. Treatment.—A most important consideration in a paving block specification is the care which should be taken in treatment. The first step of treatment is to thoroughly steam the timber. This should be followed by a strong vacuum. If green timber is used the steaming and vacuum remove the excess moisture from the wood and prepare it for the oil. These steps also remove excess air from the cells, which is one of the principal causes of bleeding. It is desirable to steam seasoned timber, because moisture is added to the wood and the blocks are brought more nearly into the expanded condition, thus decreasing the possibility of swelling troubles. If the timber is not evenly seasoned the steaming will also tend to bring it to a more uniform moisture condition. Steaming and vacuum on dry timber, just as in the case of green stock, remove much of the air from the cells and reduce bleeding.

The oil should be admitted to the cylinder without breaking the vacuum, and the pressure gradually applied. It is important that the pressure should not be raised too rapidly. If high pressures and short pressure periods are used the tendency for some blocks to receive much more than their share of oil, while others receive less, seems to be greatly increased. Furthermore, this has a tendency to give poorer penetrations, which results in much oil being near the outside of the blocks and little oil in the centers. If the pressure is very gradually raised a longer time of treatment is required. This, however, has the effect of giving better penetrations with the same absorptions and results in a more uniform distribution of the oil throughout the charge. The method of operation during the oil pressure period, therefore, has a very important bearing on the ultimate durability of the blocks, and if this step of the process is properly carried out in conjunction with the other steps of the treatment it should be possible to satisfactorily use paving oils containing a suitable grade of tar.

When the required amount of oil has been injected into the blocks the pressure is removed and a final vacuum applied, the purpose of which is to remove excess oil from the outer fibers of the wood. It has been our experience that the oil removed by the final vacuum would come out of the blocks in time even if this were not applied. Sufficient oil must be injected during pressure to allow for the loss during the final vacuum.

If a preservative containing tar has been used it is often desirable to permit a final steaming and vacuum operation. This step removes dirt and tarry matter from the surface of the wood and makes the blocks bright and clean, even when oils containing much tar and carbon have been used. It also probably has considerable influence in retarding subsequent bleeding of tar mixtures.

Suggested Traffic Regulations for the City of Toronto, Ontario

Ten recommendations for the regulation of traffic in the City of Toronto, Ontario, are contained in the report of a special traffic committee appointed last summer.

According to the committee's report a sudden increase in the number of fatal accidents in the city resulted in the calling of a meeting last July, at which there was elected a committee of seven to make suggestions for the improvement of traffic conditions. The committee consisted of W. A. McLean, Deputy Minister of Highways of Ontario; R. B. Morley of the Ontario Safety League, W. C. Coulter of the Canadian Manufacturers' Association, P. E. Doolittle and T. N. Phelan of the Ontario Motor League, J. H. Forrest of the Toronto Railway Co., and Arthur Hewitt of the Toronto Board of Trade.

At the first meeting of the committee on August 9, Mr. McLean was elected chairman and Mr. Morley, secretary. The recommendations made by the committee are as follows:

"That every driver of any motor vehicle should have a permit to drive. Permits might be issued at a nominal fee, say 25 cts., without examination, upon written application for such permit; the penalty of cancellation or suspension of permit to be inflicted only upon repeated conviction of minor offences or for the committing of a serious offence under the Criminal Code.

"That headlights on motor vehicles should be so arranged that they will not constitute a menace to the public safety, and to be such that no portion of the beam of reflected light, when measured 75 ft. or more ahead of the lamps, shall rise above 42 ins. from the level on which the vehicle stands.

"That all vehicles should keep to the right and as near the curb as circumstances and weather conditions will permit.

"That all vehicles should carry a light at night.

"That bicycles should be equipped with a warning signal.

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*Extract from a paper presented at the Newark convention of the American Society of Municipal Improvements.

†Engineer in Forest Products, Forest Products Laboratory, Madison, Wis.

"That bicyclists should be prohibited from attaching themselves to other vehicles in motion.

"That pushmobiles, children's hand or express carts and roller skates should not be used on the roadways.

"That pedestrians should be considered as a part of traffic on our streets and be subject to regulation.

"That the legislature be asked to consider the advisability of placing the responsibility for an accident upon the person injured if the accident occurs while the pedestrian is crossing a roadway (in cities) between street intersections or other recognized crossings.

"That intending passengers for street cars should be prohibited from standing on the roadway for an unreasonable time before the street car arrives at the stopping point."

Sources of Iowa Road and Bridge Funds

The accompanying table, taken from a recent number of the "Service Bulletin," the official publication of the Iowa State Highway Commission, shows the sources of Iowa road funds.

In the article of which the table is a part ("Where Iowa Road and Bridge Money Comes From and Who Levies It") it is stated that the following additional facts should be kept in mind:

"The County Road Cash Fund is spent under the direction of the board of supervisors, principally for work on the county road system. This fund is also used on the township road system for making the county's share of fills to bridges and culverts, for purchasing new right of way for township roads, for making stream changes and for railway crossing improvements.

"County Motor Vehicle Fund is spent principally for road work on the county road system. It may also be used for the construction of permanent culverts on either the county or township road systems.

"The Township Road Drainage and Dragging Funds are used exclusively on the township road system.

"The Bridge Fund is expended on both the county and township systems.

"The funds for the dragging of county roads may be taken from county road cash fund or motor vehicle fund. There is no limit to the amount that may be spent for dragging the county roads.

"The poll tax, provided for by law as two days' work of eight hours each on the roads is levied per capita on all able-bodied male residents between the ages of 21 and 45. The levy on persons outside of cities and towns is spent for and upon the township roads. All such levies in cities and incorporated towns are spent on city or town roads and streets."

Name of Fund	On What Property Levied	Amount of the Levy	By Whom Levied	Discretionary or Required by Law
A—County Roads I—County Road Cash Fund 1. Co. Road Fund	All property, including cities of first class. (Half levied on city property goes back to city or incorporated town.)	Not to exceed one mill	County Board of Supervisors	Must levy, but discretionary as to amount
2. Co. Road Building Fund	All property outside incorporated cities and towns	Two mills	Board of Supervisors	Required by Law
3. Co. Drainage Fund	All property	One mill	Board of Supervisors	Discretionary
II—County Motor Vehicle Fund (Roads and permanent culv.)	Automobiles	40 cts per HP.	By Legislature	Required by Law
B—Township Roads 1. Township Road Fund	All property outside incorporated towns	Not to exceed four mills	Township Trustees	Discretionary
2. Township Drainage Fund	All property in township, outside incorported towns.	Not to exceed five mills	Township Trustees	Discretionary
3. Road Drag Fund	All property outside incorporated towns.	One mill	Trustees	Required by Law
C—Bridge Fund	All property outside cities of first class	Not to exceed five mills	Board of Supervisors	Discretionary

Sheet Asphalt Surfacing on Old Brick Pavements at Columbus, Ohio

A description of the methods employed in resurfacing old brick pavements with sheet asphalt in Columbus, Ohio, was given by Thomas H. Brannan, Superintendent of Asphalt of that city, in a paper entitled "The Resurfacing of Old Brick Pavements with Sheet Asphalt at Columbus, Ohio," presented at the recent Newark convention of the American Society of Municipal Improvements. The following account of the work is based on data from Mr. Brannan's paper.

The extensive use of brick for paving in Columbus commenced about 30 years ago. The older brick pavements were laid on foundations of gravel, crushed stone or creosoted planks and sand. Small red bricks were used and the joints were filled with tar or sand.

In 1912 three of these old streets, having a total area of about 14,000 sq. yds., were resurfaced with sheet asphalt. Since that time similar work has been done on nine other streets, the total yardage of brick resurfaced with sheet asphalt now being approximately 75,000 sq. yds.

Surface drainage is one of the first matters to be considered in work of this kind. All of the old streets in Columbus were laid with 6-in. gutters and after putting a 3-in. course on such a street only a 3-in. gutter is left. Where this depth is insufficient either of two methods may be adopted.

By the first method the old brick are taken out of the gutter for a distance of 3 or 4 ft. from the curb, and a concrete base is laid to such a grade as to bring the new brick in the gutter to the desired height at the curb and to such a height at the outside edge as to form a shoulder for the asphalt.

By the second method the old brick are taken out as in the first case, and concrete is laid even with the top of the old brick paving at a distance of 3 or 4 ft. out from the gutter and at the desired elevation at the curb. The sheet asphalt pavement is then laid from curb to curb.

Before laying asphalt on an old brick pavement the surface should be cleaned, all dirt being removed from the joints to a depth of at least ½ in. This can be done by flushing with a fire hose or by raking out the joints and then sweeping. Flushing is the most effective, but it necessitates giving the street time to dry. For that reason sweeping is preferable during the late fall.

Where the old pavement is worn through or where its surface is more than 3 ins. below the general grade, the holes or depressions are cleaned and filled with concrete. Proper grade adjustments must be made at intersections.

A close binder containing from 20 to 25 per cent. of material passing a 10-mesh sieve is preferable to a paint coat, for two reasons. In the first place, an asphalt paint coat has to be cut back with naphtha which, unless it evaporates before the top is laid, is likely to work up through the wearing surface to the detriment of the pavement. In the second place there is a large variation in the thickness of the top course if a paint coat is used. When this condition obtains the roller compresses the thinner portions more than the others with the result that heavy traffic will further compress the deeper portions and form depressions.

A 1½-in. binder and a 1½-in. top are used in Columbus. If the old brick surface is very irregular the binder is laid in two courses, the first course being laid to fill the depressions before putting down the 1½-in. course.

At the prevailing prices for excavation and concrete foundation, the saving effected by utilizing the old brick pavement as a base for sheet asphalt amounts to about 75 cts. per sq. yd. of finished pavement. Compounded annually for 15 years at 4 per cent. this would amount to almost enough to renew the pavement.

Three of the streets resurfaced four years ago are within four blocks of the center of the city. They have not cracked or shoved, and have not needed nor had any repair. They are apparently in as good condition as they would have been had they been laid on new concrete foundations. One of them carried an extraordinarily heavy traffic last year because of the poor condition of parallel streets on each side of it. The streets resurfaced since 1912 carry lighter traffic than those laid during that year, and would be classed as residence streets. They are in good condition and have not been repaired.

Proposed Standard Forms for Traffic Counts

Standard forms for recording traffic counts were proposed by the Traffic Committee of the American Society of Municipal Improvements at the recent convention at Newark, N. J., and were adopted by the society. One of the forms—that for keeping the permanent record of the census—is illustrated herewith.

In its report the commiteee took up in some detail the taking of traffic counts in various cities, the purposes for which such counts are taken and the methods of taking them, the latter with special reference to the classification of the traffic.

Inquiries sent to 20 large cities elicited 16 replies which showed that traffic counts had been made in 8 of the cities. Those in which some form of traffic count had been made were Baltimore, Buffalo, Chicago, Newark, New York (Boroughs of Brooklyn and Manhattan), Philadelphia, St. Louis and San Francisco. Reports that no traffic census had been taken were made by Cleveland, Denver, Detroit, Kansas City, Los Angeles, Milwaukee, Minneapolis and New Orleans.

Various reasons for making traffic counts were reported. These included traffic regulation, street cleaning purposes, street planning or replanning, paving design and fixing tax values.

The classification which the committee reported as "that which would seem to be most complete" is as follows:

Rubber-tired vehicles:
  Auto trucks:
    Large:
      Empty.
      Loaded.
    Small:
      Empty.
      Loaded.
  Passenger automobiles:
    2 seats.
    3 or more seats.
  Carriages.
  Motorcycles or bicycles.

Iron-tired vehicles:
  1-horse:
    Light.
    Heavy.
  2-horse:
    Light.
    Heavy.
  3 or more horses.
  Street cars.

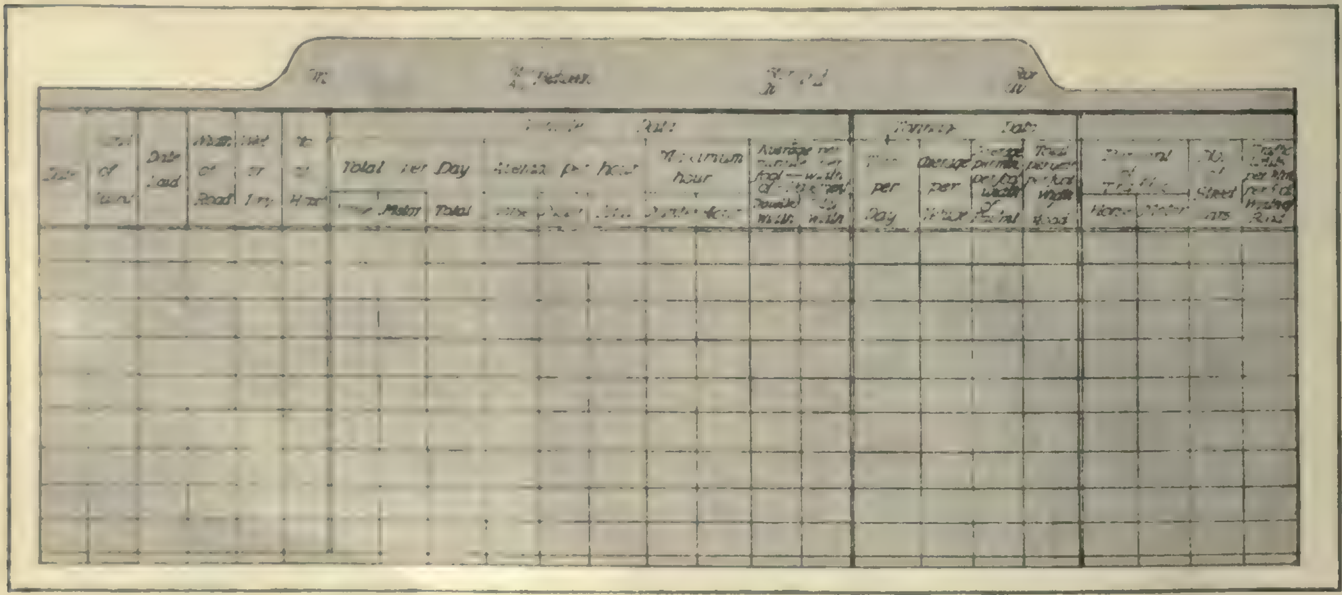
The above is the classification adopted for the standard form advocated by the society for the recording of traffic.

Higher Prices Paid Because of Delay in Awarding Contracts

Iowa counties are having to pay increased prices for bridge and culvert work because of delay in awarding contracts, according to a recent issue of the "Iowa State Highway Commission Service Bulletin."

Between July 10 and Sept. 1, of this year, 45 bridge and culvert contracts were submitted by county road authorities for the approval of the State Highway Commission. Some of those which were approved would not have been approved earlier in the season, it is stated. As a rule such contracts were accompanied by statements to the effect that the bridges were badly needed and that their construction could not be delayed until spring.

At most of the late lettings there was little competition as the large contractors had taken all the work they could complete by the end of the season. Many of the contracts were for small amounts of work and some were advertised for only a few days and only local contractors received notice.



STANDARD FORM PROPOSED BY THE TRAFFIC COMMITTEE OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS FOR RECORDING TRAFFIC CENSUS DATA.

GOOD ROADS

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The submission of articles by engineers, contractors and others engaged in road and street work is invited, All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

DECEMBER 2, 1916

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WHAT THE PUBLIC SHOULD KNOW ABOUT ROAD BUILDING

In the course of the past few years plans to conduct "campaigns of education," to teach road building in the elementary schools, and to attempt in other ways to force upon the general public knowledge of the theory and practice of highway construction have frequently been proposed. In fact, such schemes have become so common that it is desirable that road builders give them attention.

We believe that road building is an art calling for scientific knowledge, technical training and practical experience, just as the practice of surgery, for instance, calls for such qualifications, and that it is a work for specialists just as is the erection of bridges and buildings, the construction of water works, the safeguarding of the public health or the conduct of litigation. And we feel sure that the well informed will readily agree with us. If such is the case, why should the general public be expected to know any more about road building than about any other branch of engineering which finds its chief application in the field of public works?

Consider an analogous case—a proposition to instruct the public in the construction and operation of water works. So far as we are aware no such proposal has ever been made. At the same time, why should it not have as many advocates as the plan to teach road building? The water supply is a public utility that the average person—at least in towns and cities—uses as commonly as he does the roads. And if he needs a knowledge of current engineering practice in the construction of sheet asphalt, brick, wood or stone block, concrete, or any other pavement, why is it not equally essential that he possess a certain amount of knowledge regarding the building of filter beds, the laying of water mains, the installation and operation of pumping plants, and various other matters connected with water supply engineering? Is there less reason for a popular understanding of the various processes for the sterilization of water than of the chemistry of bitumens used in road building?

Consider another analogy. No serious attempt has been made so far as we remember, to "educate" the public in sewage disposal. Yet this is a matter vitally affecting the health and well-being of a large proportion of the public. Would not a "short course" in sewerage serve as useful a purpose as one in road building? Shouldn't the average citizen be expected to understand the operation of the Imhoff tank, for example, as thoroughly as he does the operation of the asphalt plant? Isn't the fact that sewage can be rendered harmless enough, in many cases, by dilution, of as much interest to the man in the street as is the fact that material to lay the dust in front of his residence may be obtained from either asphalt or coal tar?

In arguing for the popularizing of road building knowledge it is frequently asserted that the layman needs such knowledge because the road is a public utility in which his interest is peculiarly personal and close. But is this so? To be sure, nearly all are road users—in a broad sense. If we do not actually travel upon the roads our daily life is influenced to a greater or less extent by the primary transportation facilities not only in our immediate neighborhoods but also in communities at considerable distances. On the other hand, it must be remembered that the portion of the highway to which road builders devote most of their attention is the roadway—that is, the space between curbs or ditches and, generally, exclusive of the area occupied by street railway tracks. This is the part of the road used chiefly by vehicles, and the owners and operators of those vehicles are the real users of the roads. But they are considerably outnumbered by the people who neither own nor operate vehicles of any description. The great majority of the people either walk on the sidewalk or ride in street cars, and in either case cannot be properly classed as "road users," as that term is usually understood.

It seems evident then that a knowledge of road building is not necessary to those who do not use the roads. If so, it remains only to inquire whether or not any considerable knowledge of the art is essential to the well-being and happiness of those who do use the roads.

Again resorting to analogies it is difficult to find any ground for an affirmative answer. Because an individual uses a certain means for the accomplishment of his everyday affairs it does not follow that he needs to understand the principles underlying that means—it is sufficient that he know how to use it. The telephone is a common convenience, but the average man does not need a knowledge of the technique of telephony. Many other examples might be given, but the one cited should suffice to illustrate the point.

What the layman does need to know about road building is that it is a matter demanding special knowledge and special skill and that, as such, it should be left to engineers whose training and experience have given them the required knowledge and skill. Beyond this the average citizen need know nothing of road building except that it should be financed on a sound basis, as a strictly business proposition.

THE COMING A. R. B. A. CONVENTION

As our readers are aware, the 1917 convention of the American Road Builders' Association will be held in Boston, Mass., early in February. According to the announcements made by the organization, an almost ideal meeting place has been secured and the exhibition—upon which the association, of course, depends largely for funds to meet the expenses incident to the convention and exhibition—promises well even at this early date. The past record of the association is also a sufficient guarantee that the convention will be well attended and successful from every point of view.

At few times in its history has the association had a better opportunity than it will have next February to make its technical sessions of very great benefit to highway engineers. With the development of the art of road building has come increased traffic and new vehicles. Long-distance travel over the roads was unusual only a comparatively few years ago; now transcontinental motor tours excite little comment among those not directly concerned. The character of the vehicles used has undergone as striking a change. Materials of construction that had hardly been given a fair trial when the A. R. B. A. was organized are now in almost universal use. Others are coming in and must be experimented with, studied and passed upon by road builders. New methods have been devised, tried out, and discarded or given places in standard practice. Other methods, yet in the experimental stage, open up fields still little known.

When the American Road Makers' Association—as it was first called—was organized fourteen years ago only a few states had taken any part in road building; road work was controlled by counties, districts and towns. Now the state aid plan is in operation in almost all of the states and probably will be adopted in the rest within a short time. In addition the federal government has recently embarked upon a plan to aid the states in a manner similar to that in which the states extend help to their subdivisions.

The circumstances suggest an almost endless list of topics that might be profitably considered. Such technical matters as the monolithic method of brick pavement construction, the use of expansion joints in concrete pavements or the paving of streets occupied by car tracks will serve as examples of one class of subjects. In the mater of traffic, the effects of various kinds of vehicles on different types of pavements and the regulations likely to be made for such traffic might well be discussed. The merits and faults of different plans of state, county and city organization for highway work might be considered to good purpose, as might also the provisions of the various states for availing themselves of federal aid.

In the past the association has made a notable and commendable departure from the usual plan of conducting road conventions by providing a comparatively small number of set papers, thus leaving plenty of time for open discussion. There is every reason to believe that the same plan will be followed this year, but more could well be done along this line. A further reduction in the number of papers, the elimination of all papers and discussions on elementary subjects and the setting aside of one entire session for the open discussion of topics selected by the convention itself, would, together, make an experiment well worth trying and having every probability of success.

HIGHWAYS FOR COAST DEFENSE

A little over a year ago attention was called in these columns to the possibility of utilizing highways along the seacoast as a means of national defense. A former high official of the national government had seriously suggested the building of a number of transcontinental highways to facilitate defending the country from invasion, and the Pan-American Road Congress had adopted a resolution recommending to Congress the advisability of investigating the building of roads for military purposes.

For reasons which were set forth in some detail at that time—and are still valid—the scheme for a system of transcontinental highways lacks merit as a measure of military preparedness. The building of roads along the seacoast, so locating and paving them as to make them of use for defensive purposes, is another matter, and one in which we believe there are great possibilities. Attention is again directed to it by extracts from a paper by an officer of the Coast Artillery printed elsewhere in this issue under the caption, "The Highway System as a Military Adjunct."

In our former comment on this matter, we suggested that the most logical use for any federal funds that might be appropriated to aid local road work would lie in the building of highways along the coasts and along the borders. Since then a federal aid measure has been passed, but it contains no specific provisions for roads so located as to be of military value.

The seacoast of the United States, including the Gulf Coast, has an extent of over 5,000 miles. Leaving our inadequate navy out of consideration, much of this shore line is unguarded and would afford plenty of opportunity for the landing of hostile forces. It is inconceivable that this country can always remain at peace or that, when war comes, it can be fought entirely on the sea or on foreign soil. As invasion by land is apparently less to be feared than invasion from the water, it would seem obvious that the first need for military highways is along the coast.

While the many uses to which such coast roads could be put are apparent even to those without military knowledge, the planning of a system of such highways and the location of the individual roads should be undertaken only with the advice of the proper military authorities. Under present conditions the national government, through the army or otherwise, probably can not build the roads, but it is possible for the several states along the Atlantic and Pacific Coasts to use the funds available to them from the federal treasury on roads of this character. And on no other roads could national funds be more fittingly employed, for they would be of very great value to the whole people. In addition, they would be of great advantage to states and comunities in which they were situated since in almost every state on both coasts, a shore road is needed to serve local commercial and pleasure traffic.

The Importance of Street Cleaning Appropriations[*]

By GUS H. HANNA[†]

I need not cite any dry statistics to convince this audience that city budget makers have too frequently designated the street cleaning department as a near relative of Kelly's goat and have pruned its appropriation to the verge of criminality. I say criminality, because to impair the health of a city is criminal, especially where the cuts are made for the benefit of some boulevard in the suburbs that will enhance the value of land adjacent thereto, owned in all probability by some scheming real estate firm which is anxious to dispose of its possessions for a greatly enhanced price at the expense of the taxpayers. Boulevards are a luxury not at all conducive to the comfort of the daily toiler, unless he is the owner of an automobile. If the pruning knife must be used I would suggest pruning the boulevards. The cleanliness of a community is a pretty accurate barometer of its health. I am not a physician and am not capable of adding anything to the controversy about the extent to which disease germs are transmitted by dust. I understand, in a general way, that there is less tendency today than there was a few years ago to attribute infection to dust-borne germs, although I think no one has gone so far as to deny that germ diseases in some instances are transmitted in dust. Further than this, I never heard of anyone claiming that dust was a benefit to health or cleanliness a menace. And leaving health out of the question, nobody wants filthy streets or dusty premises. Call it a mere sentiment if you will, but it is a sentiment that distinguishes the civilized man from his cave-dwelling ancestors.

And in relation to street cleaning cost, I want to point out that the most economical place in which to perform the street cleaning function is in the street. The same filth must be combated somewhere, perhaps where it originates, perhaps where it is blown after lying neglected on the pavement. I recall a rhyme which appeared some years ago in an Ohio paper:

We have a cheap and novel way
    To clean a city street
The summer sun beats down all day;
    The breezes fan it as they play
And blow the dust off neat.
    The refuse of two thoroughfares
Is on our bric-a-brac and chairs
    And in the food we eat.

The housewife is usually an advocate of municipal economy. Women taxpayers and women voters are usually strict contenders for low taxes, but who ever saw a woman that wanted the street cleaning neglected to save a few dollars? She knows that a dusty street means a dusty home and that tedious hours must be spent in cleaning furniture and rugs; that doors and windows must be kept closed when fresh air would be welcome; that dirty skirts mean laundry and cleaning bills; that her own time is the same as money, and, that where servants are employed, the cost of dusting and sweeping is an actual, tangible tax upon the family income. She knows, what anyone knows upon reflection, that it is easier to collect filth upon a broad level surface where it originates than it is to wipe minute particles from vases and antique china, to extract it from rugs and draperies and efface it from carved furniture.

The merchant realizes the same thing when it is called to his attention. There is scarcely a mercantile concern in which the cleaning and dusting of stock is not a regular avenue of expense. There are many businesses that are obliged to hold periodical sales of goods soiled upon the shelves and counters, realizing from them considerably less than they cost. Any honestly expended appropriation for street cleaning is a source of economy to such institutions.

During the last year we have had a frightful visitation of infantile paralysis. I venture to say that a million or more of dollars has been spent in emergency measures to eliminate the disease. Yet it is noteworthy that the cases occur chiefly where children are forced by crowded conditions to play in the street, and where streets are insufficiently cleaned, or perhaps so worn that they are uncleanable. Among the other offsets against the cost of clean pavements and cleanable pavements I am asking you to consider the money spent to control this plague. I can not ask you to offset the loss of babies' lives, for the tears of a mother, even though she is a tenement mother, are something that I will not ask this audience to appraise in cold dollars and cents.

I hope I have made it plain to you that tax expenditures are no different from other expenditures which individuals and firms are forced to make. The money comes out of the same pocket. And the only question to consider in relation to the disposal of street refuse is at what point it can be most effectually and economically disposed of, whether upon the street itself, or on our household effects and stocks of merchandise or in the human respiratory tract and digestive system. Will we pay the street cleaner, on one hand, or the hired girl, the stock clerk, the scrub-woman or the doctor on the other, making no allowance whatever for the labors of wives, for everybody knows that wives work for board and love.

Some plead for street cleaning funds as a justifiable luxury. I contend for them as a means of saving money in the performance of what must be performed by some means, in any event.

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[*] From a paper on "Health and Sanitation," presented at the second annual meeting of the Society for Street Cleaning and Refuse Disposal of the United States and Canada, at New York, N. Y.

[†] Formerly Superintendent of Streets, Cleveland, O.

Government Experimental Road Work in 1915

Experimental road work commenced by the Office of Public Roads and Rural Engineering during the year of 1915 was confined to the use of bituminous materials in road construction. The work, which is outlined in Bulletin No. 407 of the U. S. Department of Agriculture (note of which is made on another page of this issue), included the construction of roads surfaced with bituminous macadam, bituminous concrete, bitumen and coralline rock, bituminous sand, and plain macadam with bituminous surface treatments.

Work was done in Washington, D. C., Buena Vista, Jupiter, Ocala and West Palm Beach, Florida; Montgomery County, Maryland, and Alexandria County, Virginia.

The work in Washington, D. C., comprised the construction of bituminous concrete pavements on two drives in front of the main building of the U. S. Department of Agriculture.

At Buena Vista, Fla., a driveway leading from the Miami-Lemon City Road into the grounds of the experimental gardens of the United States Department of Agriculture was paved with bituminous macadam with a coralline rock aggregate.

At Jupiter, Palm Beach County, Fla., a section of the West Lateral Road was paved with a sand-asphalt pavement built by the layer method.

The work at West Palm Beach, Fla., comprised the construction of a sand-asphalt pavement built by the mixing method. The pavement was laid as an additional section adjoining the seven experimental sections built of coralline rock and bituminous materials in 1914.

At Ocala, Fla., two sections of road were put down. The first section was an asphaltic macadam built with limestone aggregate and a residual asphalt binder. The other section was paved with a sand-asphalt mixture.

Experimental work was done on two roads in Montgomery County, Maryland—the Falls Road and Bradley Lane. On the Falls Road five experiments were made with different surface treatments. These were as follows: No. 1, asphaltic petroleum, cold application; No. 2, residual asphaltic petroleum, hot application; No. 3, coal tar preparation, cold application; No. 4, refined water-gas tar, cold application; No. 5, refined coal tar, hot application. The work on Bradley Lane comprised the construction of three sections of bituminous macadam. Two sections were built by the ordinary penetration method with an oil-asphalt binder. The third, situated between the other two, comprised two short stretches of road paved with a bituminous macadam having a mixed sand and asphalt binder, the proportions of sand used being different in the two sections.

The Alexandria County work comprised twenty experiments on the Mount Vernon Avenue Road. The work was divided into three sections comprising respectively twelve, four and four experiments. The experimental surfaces in Section 1 were laid on a gravel base; those in Section 2 on an old bituminous macadam road as a base, and those in Section 3 on an old water bound macadam road as a base. Eight experiments comprised the construction of surfaces by the penetration method and the remaining twelve, surfaces by the mixing method. Sandstone, gneiss, gravel, trap and granite were used as aggregates.

Street Lighting on a Milwaukee County Road

By ARTHUR J. SWEET*

A particularly notable example of highway lighting is the service recently installed for an 8,000-ft. stretch of the Watertown Plank Road in Milwaukee County, Wisconsin. This road is the main highway from Milwaukee westward to Waukesha, Watertown and Madison, Wis., and is a popular one with automobile tourists and with residents of Milwaukee for short drives in the evening. The section on which lights were installed passes the School of Agriculture, the Home for Dependent Children and other institutions. For about half its length the road is paved with asphalt; the other half is paved with concrete.

A typical view of the lighting installation, which was personally planned by the writer, while a member of the firm of Vaughn, Meyer and Sweet is shown in the accompanying illustration. The installation employs 400 c. p. gas-filled incandescent lamps used with Holophane refractor globes and with lantern bodies of special design. The light units are supported by concrete posts, at a height of 22 ft. 6 ins. above the road and are spaced 180 ft. apart, alternate units being placed on opposite sides of the road. The resulting illumination is so uniform that such differences as may exist are too slight to be detected by observation. The brightness of the illumination provided—about twice that of the brightest moonlight—together with uniformity of illumination and relative freedom from blinding glare, makes this stretch of road probably the best lighted road in America.

ELECTRIC LIGHTING INSTALLATION ON THE WATERTOWN PLANK ROAD, MILWAUKEE COUNTY, WIS.

Under average conditions applying to country road lighting the toal annual costs of highway lighting with an installation of this character, including cost of energy, cost of maintenance, and interest and sinking fund payments on the investment, will be, approximately, 30 cts. per running foot of highway. In the case of roads adjacent to large cities or to cheap sources of power such as hydro-electric plants, the cost will be somewhat less than the above figures, and will, of course, be correspondingly greater where cheap sources of power are not available.

A brightness of illumination of about the intensity of full moonlight, other features of the installation and service being identical with those described above, could be afforded at an annual cost, under average conditions, of approximately 22 cts. per lin. ft. of highway.

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*Consulting Engineer, Milwaukee, Wis.

Pennsylvania Citizens Urge Improvement of the Susquehanna Trail

On November 22 a large delegation called upon Commissioner Black at Harrisburg, Pa., with the object of interesting the State Highway Department in the development of the through route from Harrisburg to the New York state line, to be known as the "Susquehanna Trail." For the greater part of its length the proposed highway follows existing roads by way of Williamsport, Roaring Branch, Canton and Troy, Pa. The argument presented by the delegation was that the road would form a connecting link between Harrisburg, Pa., and Elmira, N. Y.

State Senator E. E. Jones, who headed the delegation, stated the object of its visit and introduced Congressman McFadden and State Senator Sones, who spoke in favor of the development of certain portions of the highway. Among other prominent speakers were Mayor Stowe, of Canton, President Aikens of Susquehanna University, and Deputy Attorney General Emerson Collins, each of whom emphasized the willingness of the citizens of the counties concerned, viz., Lycoming, Bradford, Northumberland, Union and Snyder, to cooperate with the state in the construction of the road.

Commissioner Black, in outlining the policy of the State Highway Department, told the delegation, in effect, that the legislature must first make a sufficient appropriation to carry on the work, but that until such time the department was willing to go ahead with the construction of the road in each county as far as funds were available. Chief Engineer Uhler also addressed the delegation.

The Charter of the City of Los Angeles, Cal., has been amended to permit the municipality to make street improvements by either contract or day labor. The amendment, which was approved by popular vote at the recent election, also permits the assessment of the cost upon abutting property or upon an improvement district. No work paid for by special assessment may be done by day labor unless such a course shall have been petitioned for by a majority of the owners of frontages assessed or unless the city itself submits the low bid in the usual manner. If, however, the bids received for an improvement are deemed excessive by a majority of owners of frontages, the city may reject all bids and perform the work by day labor if application for such action is made to the council by a majority of the owners within 20 days after the reception of the bids.

Colloidal Clay in Bitumens for Pavement Construction

The effects of colloidal clay in bitumens used in the construction of pavements is discussed at length in a recent paper by Clifford Richardson of New York. The paper is entitled "Importance of the Relation of Solid Surfaces and Liquid Films in Some Types of Engineering Construction," and was presented before the Western Society of Engineers at a meeting in Chicago, Ill., on November 20.

As indicated by the title, the paper takes up a broader subject than the use of colloidal clay in bituminous road materials, which is only one of the phenomena between solid surfaces and films of liquid in contact therewith. These relations as between water and mineral matter can be interpreted along lines similar to those of the application of the principle to collidal clay and bitumens, according to Mr. Richardson, and are of importance to engineers in connection with the stability of earth dams, fills, and similar structures.

Colloid is defined as a "substance of gelatinous nature, permeable by crystalloid solutions, diffusing not at all or very slowly through animal or vegetable membranes, and scarcely affecting by its presence the freezing point or vapor tension of its solutions; also, any of various non-gelatinous substances exhibiting the above properties." According to Mr. Richardson, however, "One cannot properly speak of a substance, in itself, as a colloid. The word denotes, rather, a state of matter dependent on the relation of one phase to another, and is one in which all material can exist. It relates, as regards solids and liquids, to the state of subdivision of the former and its dispersion through the latter." He points out that whether or not a solid is in a colloidal state depends not only upon its state of subdivision but also upon the viscosity of the liquid or continuous phase or medium in which it is dispersed. For example, a substance which, because of its degree of subdivision, would settle rapidly out of water, might exist in a colloidal state in a very viscous bitumen.

"Great energy is displayed by the contact of solid surfaces with liquid films," the paper continues. "This is known as surface energy. Where a solid is uniformly dispersed through a liquid this is known as a physical system. In such a system energy is developed and this energy is proportional to the area of surface displayed by the solid and to the character of the liquid in which it is dispersed. The relation of the extent of surface displayed by the solid and the liquid covering it, plays an important part in the surface energy developed in any system consisting of subdivided mineral matter and bitumen in a more or less liquid form. It is of great interest in reaching a rational interpretation of the relations of these materials in the construction of asphalt pavements and roads."

The greatly increased surface area of the particles in a fine aggregate as compared with that of the particles in a coarser material was pointed out by Mr. Richardson in the book, "The Modern Asphalt Pavement." In that it was shown that in one gram of sand of uniform grains, having a diameter of about 2 mm. each, there will be 212 particles, with a surface area of 15 sq. cm., which by reducing the particles to a diameter of .0025 mm. will increase the number of particles to over 46 billion and the surface area to over 9,000 sq. cm.

Continuing the discussion of this phase of the subject, the paper is as follows:

"As stated by Ostwald: 'Surface energy, as usually discussed, is made up of two components; a capacity factor as measured by the absolute surface, and an intensity factor as measured by surface tension. The latter type of surface energy endeavors to decrease the surface of a system if free energy is available.'

"In a sheet asphalt paving mixture the capacity factor is measured by the degree of fineness of the mineral aggregate, and the intensity factor by that of the character, that is to say, the surface tension, of the bitumen which is in use as a cementing material.

"In the case of very fine aggregates the increase in the surface area, that is to say, the specific surface, is, as has been demonstrated, enormous, as compared to that of a coarse one and would necessarily call for a larger amount of bitumen to cover it. This fact has an important bearing on asphalt surface mixtures, as prepared from different sands and with different amounts of filler. For example, the mineral aggregate of a coarse New York mixture laid in 1895 was found to have a surface area of about 44 sq. ft. in one pound of material, whereas in a finer one of 1898 this was increased to over 60 sq. ft. The former was an unsatisfactory, the latter a very satisfactory pavement. At that time attention was called to the fact that the more extended area of the finer aggregate would require a larger percentage of asphalt than the coarser and was desirable on that account.

"No further explanations or conclusions as to the nature of the relations involved were then drawn. With the further study, which has been so widely carried on in the last ten years, on the relation of surfaces and films and of the characteristics exhibited by matter in a highly dispersed or colloidal state, we are today in a position to comprehend more fully and explain why this extended surface is a matter of importance in the construction of a satisfactory pavement, and why accepted methods of procedure, which have, hitherto, been founded more or less on an empirical basis alone and not upon certain definite physical laws associated therewith, have been successful. Surface phenomena are now recognized as being of great importance. * * *

"Investigations in connection with the relation of the surfaces of mineral aggregates of the type employed in the construction of asphalt pavements and of films of bitumen which serve to cement them together and in other engineering problems as well, have proved of interest not only as explaining the reasons for the successful results obtained in the construction of pavements of the type mentioned, as developed empirically during the last twenty years, but also, carrying these principles much further, in developing the possibility of producing other structural materials containing large percentages of mineral matter in a colloidal state, which are of value as presenting unusual physical characteristics and availability for particular uses.

"It was empirically shown as long ago as 1894 to 1896 by the study of successful surfaces that a satisfactory sheet asphalt pavement was one which contained, as part of the aggregate with which the bitumen is combined, a considerable percentage of filler, that is to say, of extremely fine mineral matter. This was attributed to the large extent of surface which such an aggregate offered to which bitumen might adhere, and in this respect was a correct inference. At that time, however, the relation of surfaces and films and the principles of the chemistry of matter in a colloidal state had not been made clear, while today this subject has been more thoroughly elaborated and affords a means for the rational interpretation and explanation of the relation of surfaces and films, as applied to combinations of a mineral aggregate and bitumen, and of the enormous energy developed by the extensive surface presented by solid matter in the colloidal state. This now makes it possible to carry out work of this description on a scientific and rational basis."

Clay varies in character, according to the paper, and is in a more or less colloidal state as regards the water with which it is associated, the degree of colloidality probably depending upon the manner of its formation, sedementary clay usually being more colloidal than residual clay. Continuing, the paper states:

"It is recognized that clay can be readily diffused in water. Dry clay cannot be readily diffused through the denser forms of bitumen because the individual particles of the clay adhere to one another, and because they are covered with an absorbed film of air or water, which prevents its being coated with bitumen. For these reasons dry clay cannot be dispersed uniformly through such a viscous medium as a dense bitumen. If, however, the clay is originally thoroughly dispersed in water as a continuous phase it can then be emulsified with any bitumen which is sufficiently liquid at temperatures below that of boiling water to make it possible. On the removal of the aqueous phase from the emulsion by heating, the highly dispersed clay will then enter into the bituminous phase without difficulty and will then be dispersed therein in a colloidal state or as a colloidal solution of clay in bitumen.

"Clay in a colloidal state can also be introduced in the same way with greater facility into the more liquid types of asphaltic bitumen. The amount introduced in this way may reach, with certain oils, as much as 60 per cent. Such a material may be used for fluxing the harder bitumens for the purpose of introducing colloidal clay into them in a simpler manner than by attempting to do so directly. With a sufficient amount of clay in a colloidal state in the flux, the latter has such stability that it can be shipped without packages. Combinations of asphalt and colloidal clay may be obtained in this way, which present some extraordinary and valuable characteristics from an industrial point of view."

Reorganization of the Office of Public Roads and Rural Engineering

On November 1 there became effective a reorganization of the Office of Public Roads and Rural Engineering of the United States Department of Agriculture. The present organization of the office is shown in considerable detail on the accompanying chart.

The work of the office is divided into two main branches: 1, Engineering, and 2, Management and Economics. There are also two general inspectors who report only to the director. The first main division, engineering, is in charge of the chief engineer who in the absence of the director becomes acting director. The chief of management, who has charge of the management and economics division, becomes acting director in the absence of both director and chief engineer.

The work coming upon the office in the administration of the federal aid law will be handled by the highway construction and maintenance section of the engineering branch. This division will also have charge of the survey, inspection, construction and maintenance of forest roads under the provisions of section 8 of the federal aid road act. This work is handled by districts as indicated on the chart, each district being in charge of a district engineer reporting directly to the chief engineer.

The principal details of the organization which are not shown upon the chart are included in the following paragraphs from "General Memorandum No. 1" of the office:

"The general inspectors shall inspect field operations upon instructions from the director, and shall report thereon to the director.

"No change shall be made in work in progress, nor shall any new work be undertaken by employees in either branch, except by direction of the chief of the branch involved.

"No employee shall conduct, except through his immediate superior, any official business with other employees.

"Instructions to the chief engineer and the chief of management shall be given only by the director or by the acting director.

"Should the director find it necessary to make a suggestion or give instructions to any employee of either branch, such employee shall forthwith give to his immediate superior a written memorandum covering the suggestions or instructions, which memorandum shall be submitted promptly, through the proper channels, to the chief of the branch in which he is employed. This restriction shall not apply to general inspectors."

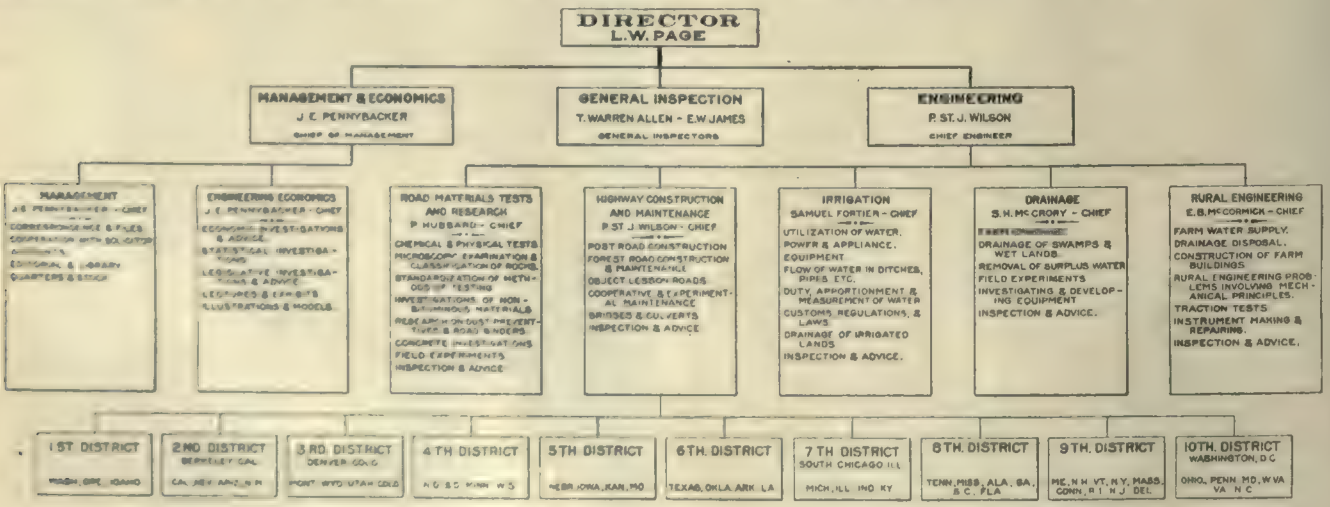
NEWS NOTES

Laws Governing Motor Traffic are recommended in the current report of the Board of County Road Commissioners of Wayne County, Mich.

A Fine of Not Over $100 or imprisonment in the county jail for not more than a year, or both, at the discretion of the court, is the penalty prescribed by the Iowa statutes for injuring or defacing "any sign board, design or other markings designating routes."

Extensive Reduction of Street Grades is under way in San Francisco, Cal. Excessive grades are of somewhat common occurrence in the city and deep cuts have had to be made in some places. In one case an intersection was lowered about 14 ft., a grade reduction of about 3½ per cent. being effected thereby.

Rounded Corners at Road Intersections are made at all important crossroads, and at the junctions of all roads where the traffic is sufficiently heavy to warrant it, in Crawford County, Iowa. This practice, according to the "Service Bulletin" of the Iowa State Highway Commission, is regarded with so much favor by the farmers that they donate the land required for extra width in the right of way.



ORGANIZATION CHART—OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING.

COMING MEETINGS

December 5-7—American Association of State Highway Officials—Annual meeting, St. Louis, Mo. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

December 7-9—Safety First Federation—Annual convention, Baltimore, Md. Secretary, W. D. Heydecker, 29 West 39th Street, New York, N. Y.

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

December 26-30—American Association for the Advancement of Science—Meeting, New York, N. Y. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

January 23-25, 1917—American Wood Preservers' Association—Annual meeting, New York, N. Y. Secretary, F. J. Angier, Baltimore, Md.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

February 8-10, 1917—American Concrete Institute—Annual meeting, Hotel LaSalle, Chicago, Ill. Secretary, Harold D. Hynes, 1418 Walnut Street, Philadelphia, Pa.

Conference on Highway Engineering Education

A conference to discuss the subject of highway engineering instruction in the civil engineering courses of universities and colleges is to be held at 8:30 p. m., December 29, at the Automobile Club of America, New York, N. Y., according to a recent announcement from the National Automobile Chamber of Commerce.

The conference will be held under the joint auspices of the Society for the Promotion of Engineering Education, the American Association for the Advancement of Science, the National Automobile Chamber of Commerce, the Automobile Club of America, and the National Highways Association. The organization of the meeting, it is stated, is due principally to the efforts of Arthur H. Blanchard, Professor of Highway Engineering at Columbia University and Secretary of Section D, Engineering, of the American Association for the Advancement of Science.

The program is being prepared and will include papers and discussions.

MEETING

Massachusetts Highway Association

The regular quarterly meeting of the Massachusetts Highway Association was held at the City Club, Boston, Mass., on November 9. A business meeting was held at noon and dinner was served at about half past twelve. Among the speakers were Col. William D. Sohier, Chairman of the Massachusetts Highway Commission, W. G. Harger of the New York State Commission of Highways; James H. MacDonald, former State Highway Commissioner of Connecticut, and others.

At the business meeting it was voted to add seven members to the board of government of the organization to arrange for the reception of the delegates at the convention of the American Road Builders' Association in Boston in February of next year. The men appointed to serve in this capacity are Wm. E. McClintock, one of the original members and a former chairman of the Massachusetts Highway Commission; Harold Parker, a former chairman of the Massachusetts Highway Commission and a past president of the American Road Builders' Association; Michael Driscoll, Superintendent of Streets, Brookline, Mass.; George E. Stuart, Street Commissioner of Newton, Mass.; Fred H. Clark, Superintendent of Engineering and Streets, Springfield, Mass.; Ransome Rowe of the Rowe Construction Co., Boston, Mass., and Walter E. Hassam, General Manager of the Hassam Paving Co. of Worcester, Mass. Arrangements are to be made for a reception to the delegates and the organization has voted an appropriation for the use of the committee in charge of the reception.

The officers of the Massachusetts Highway Association are: President, Louis K. Rourke; Vice Presidents, John A. Williams and John M. Keyes; Secretary, John M. McCarthy; Treasurer, Charles A. Brown; Directors, Charles J. Bennett, Richard A. Jones, Henry A. Spates and John A. Gaffey.

LETTER TO THE EDITOR

Stone for Bituminous Macadam

Editor, "Good Roads":

In the November issue of your paper you printed an article by me on the comparative value of penetration roads. I have just received a comment on this article which is of sufficient interest, I believe, to warrant its publication for the information of others. The comment comes from R. W. Scherer, Secretary of the Wisconsin Crushed Stone Association. Mr. Scherer says:

> Penetration macadam is certainly worth considering as much for the splendid surface it affords as for the saving in first cost and maintenance. The advantage that always appeals to me is the inherent stability of the large aggregate. Being placed without admixture on the base, and rolled, the stones must be contiguous, which can not be accomplished in mixing. If, as you say the base is left open, an excess of asphalt in the top course can work into this base and anchor the top course. If the bottom is filled or bonded with stone dust an excess of binder, no matter of what type, will permit movement in the body of the top course.
>
> You quote Mr. Pillsbury: "The large stone, it is found, binds together more firmly than smaller stone." And again: "With small stone it is practically impossible to secure any great depth of penetration." From a very careful study of the preparation of crushed stone for this class of work I can say that it does not depend upon the size of stone, but on the range of sizes admitted. To get perfect penetration it is only necessary that the aggregate be **even-sized.** You can get as thorough penetration in stone ranging from ¾ to ½ in. as in stone ranging from 2 to 1½ ins. The essential part is that the "fines" are thoroughly screened out. While I was sales manager of the Trap Rock Co. of Minneapolis, we prepared crushed trap rock especially for this work, re-screening over a 1¾-in. ring stone that had passed through a 2-in. ring. Needless to say the penetration of such a layer was very easy. The stone could be dumped on the base from a wagon without leaving spots that could not be penetrated as is usually the case. It is the presence of "fines" that prevents penetration.
>
> I am sure that wherever the thickness of your top course makes it advisable or necessary you can safely use a smaller size, if it is only even-sized, though the largest size possible is always preferable on account of the greater stability.

D. T. Pierce,
Executive Assistant,
The Barber Asphalt Paving Company.

Philadelphia, Pa.

EQUIPMENT — TRADE — MATERIALS

Trailer Flusher and Tractor Used in Springfield, Massachusetts

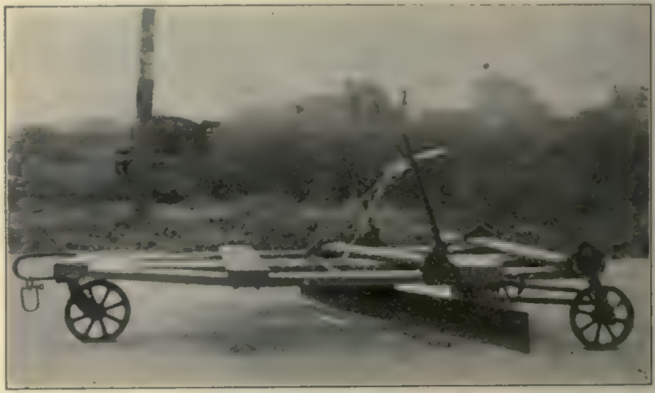
A tractor and trailer street flushing outfit of unusual size has been added to the equipment of the Department of Streets and Engineering of Springfield, Mass.

The outfit consists of two units, a Knox tractor and a Hvass flushing trailer. The tractor is a Model 35, 4-wheeled machine of the detachable type. The trailer frame is built of 8-in. channels and 8 in. I-beams and carries a steel tank 18 ft. long and 4 ft. in diameter. The trailer is mounted on silicon manganese steel springs with Archibald axles. The wheels are equipped with 10 by 1¼-in. steel tires of the dual type, and are carried on 4-in. axles. The shell of the tank is made of 3/16-in. plates and the heads of ¼-in. plates. The capacity is 1,700 gals. The four flushing nozzles and two sprinkling heads are mounted as shown in the illustration, the sprinkling heads and two flushing nozzles at the front of the tractor and the other two flushing nozzles just in front of the rear wheels of the tractor. The pump supplying pressure for the discharge is mounted on the tractor and is of the centrifugal type and of special design. It is capable of discharging 350 gals. of water per minute at a pressure of 35 lbs. The sprinkler heads are fed from the same pipe line as the forward flushing nozzles and are controlled by a 3-way cock to permit the water to flow to the sprinkler heads or flusher heads. The nozzles and heads are all controlled from the driver's seat by snap levers immediately in front of the operator. One man can control the entire outfit, although it is stated that in some instances two would probably be preferable. The pump is driven by a special power take-off which is a part of the equipment. The connection from the tank to the pump is of special design and allows sufficient flexibility for turning in any direction. Among the advantages claimed for the outfit are the economy of operation due to the elimination of the necessity for frequent stops, the short turning radius of the outfit, and the possibility of detaching the tractor from the flusher during the winter, when it can be used for other work.

The manufacturers of the tractor and flushing equipment are the Knox Motors Associates, of Springfield, Mass., and Charles Hvass & Co., of New York, N. Y. The Superintendent of Streets and Engineering of Springfield is F. H. Clark.

New Road Plane

A machine for crowning and repairing roads which has recently been put on the market is shown in the accompanying illustration.



HODGE ROAD PLANE.

The machine consists of a frame, mounted on three wheels carrying an adjustable blade with a cutting edge. The frame is made of hard wood and steel and is 9½ ft. long. The weight of the machine is 650 lbs. The blade is set at an angle, as shown, and is adjustable by means of levers. The plane is intended primarily for crowning and leveling earth and gravel roads.

KNOX TRACTOR AND HVASS FLUSHER—USED IN STREET WORK AT SPRINGFIELD, MASS.

The machine is manufactured by the Hodge Road Machine Co. of Ligonier, Indiana.

Stone Unloader for Road Work

An unloading machine designed especially for the use of road contractors is shown in the accompanying illustration.

Briefly described, the machine consists of a belt conveyor carried on a suitable frame and mounted with a power plant on a 4-wheeled truck. In operation the machine is set up at the side of the track, under which a shallow trench is dug to receive the lower end of the belt and the feeding device. The top of the trench is covered by a wooden platform in which are set three sliding gates covering holes through which the stone dropped from the bottom of the car is fed to the horizontal portion of the belt conveyor underneath. These gates are operated by levers and can be opened and shut separately to regulate the feed to the belt as desired. The inclined portion of the belt is carried on a frame which can be set at the angle necessary to bring the discharge end over the body of the wagon or truck into which the material is discharged. Where the ground is level from the track to the wagon the discharge end of the conveyor is 7½ ft. above the ground with the conveyor set at an angle of 26 degrees with the ground, the wagon being 20 ft. from the track. The machine is guaranteed to carry stone with the conveyor at an angle of 29 degrees.

BURCH STONE UNLOADER.

The belt is of the regular conveyor type, 16 ins. wide, 4-ply, with ⅛-in. rubber top. It travels at a speed of 225 ft. per minute, delivering stone to the wagon at the rate of 1 cu. yd. per minute. The power is furnished by a 4-HP. "Alamo" gasoline engine. A clutch is provided at the end of the elevator within easy reach of the wagon, so that it can be operated by the driver. The weight of the entire machine is less than 2 tons.

The machine is known as the Burch stone unloader and is manufactured by the Burch Plow Works Co., of Crestline, Ohio.

Shop Inspection of Steel for Illinois Bridges

The State Highway Department of Illinois through its Bridge Engineer, Clifford Older, has recently sent out the following letter to fabricators of structural steel for bridge work:

"We believe it to be desirable that shop inspection of structural steel be made before the shop coat of paint has been applied.

"In the future, therefore, you will kindly notify us a sufficient length of time in advance of the painting of the fabricated steel, in order that our inspector may reach your shop previous to the application of the shop coat.

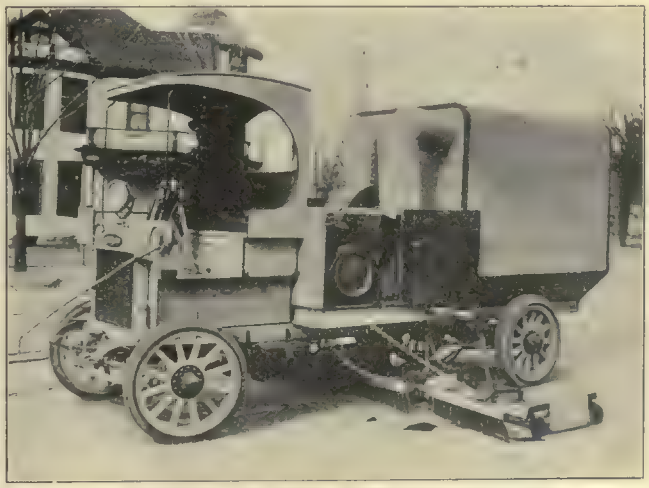
"In this connection, I desire to call your attention to clause 359 of our General Specifications for Bridge Work, Edition of July, 1915, which states in part, that all parts which come in contact shall be painted with two coats before they are riveted together.

"In the future, failure to comply with this provision will be considered sufficient cause for rejection of the fabricated steel."

Vacuum Street Cleaner

A motor-driven vacuum street cleaner which has been used successfully in Los Angeles, Cal., and in other cities is shown in the accompanying illustration.

Briefly described, the machine consists of a large 2-compartment bin, a blower, an engine, and the necessary brooms, suction head and piping. The power for the cleaner is supplied by an 18 HP. 4-cylinder marine type gasoline engine. The machine is mounted on a specially built motor truck. It sweeps a space of 12½ feet wide and can be operated at a speed of from 3 to 4 miles an hour, according to conditions. The sweepings are picked up and deposited in the large bin until 2¼ cu. yds. have been collected, when they are dropped at some convenient place. It is stated that under ordinary conditions the machine will clean about 200,000 sq. yds. of pavement per day, at a cost of less than 10 cts. per 1,000 sq. yds.


CALIFORNIA VACUUM STREET CLEANER

The special advantage claimed for the machine is, besides the low cost, that it will clean the streets dry without raising dust. The machine is made by W. E. Baxter, of Los Angeles, Cal.

Refuse Collection With Electric Trucks

Electric vehicles have been used in Barnes, England, for the collection of refuse, with a considerable saving as compared with horse-drawn equipment, according to A. Jackson Marshall of the Electric Vehicle Section of the National Electric Light Association.

The adoption of electric vehicles in Barnes was decided upon, it is stated, after a 14-day test of a 3-ton machine, accurate data on its operation being kept. Each of the vehicles used has a capacity of 4½ cu. yds. and is capable of a maximum speed of about 10 miles an hour. Each truck holds twice as much as the ordinary horse-drawn cart previously used and can collect 28 loads per week as compared with 21 loads for the horse-drawn vehicles. It is estimated that 85 of the electric vehicles now do work which was formerly performed by 275 horses.

Similar results have been obtained in the City of Paterson, N. J., according to the Electric Vehicle Section of the National Electric Light Association. It is stated that in that city 20 3-cu. yd. wagons were used to cover 150 miles of streets, and that after numerous difficulties the city decided to install electric trucks. Although the initial expense was fairly heavy, according to reports, it was estimated that the saving during the first year amounted to $6,000, while the saving for the second year was estimated at $22,000 to $25,000.

The Sanitary Department of the City of Boston is also operating 5-ton electric trucks, it is stated, and is finding them satisfactory.

"White Good Roads Trucks"

A handsome book entitled "White Good Roads Trucks" has recently been prepared by the White Company, of Cleveland, Ohio, for distribution among contractors, road officials, and engineers.

The book is paper covered, 9 by 12 ins. in size, and contains 56 pages. It is devoted to descriptions of White trucks for road building and of the work done by the trucks in various parts of the country. Much of the matter is presented in the form of illustrated articles containing detailed cost data on the operation of trucks in various kinds of road work. Among the articles are the following: "Speeding Up the Maintenance of Dirt Roads," "Good Roads Trucks Reduce Upkeep One-Half," "Good Roads Truck Saves Large Sums for Etowah County," "Fayette County Lays Macadam at Rock Bottom Cost," "Power Dumping Trucks in Asphalt Maintenance," "Motor Trucks Indispensable to Paving Contractors," and "Good Roads Trucks on Mountain Peaks."

The booklet is profusely illustrated by excellent halftones showing White trucks of various kinds and also showing the machines in operation in different parts of the country. In all there are nearly 200 illustrations.

Most of the book is devoted to the machine known as the "White good roads truck," but several pages in the back of the book are given up to a detailed description of a White combination truck for road maintenance and construction. This machine is a truck which can be used for sprinkling and flushing for appying heavy or light bituminous binders.

PUBLICATIONS

"ECONOMIC SURVEYS OF COUNTY HIGHWAY IMPROVEMENT." By J. E. Pennybacker, Chief of Road Economics, and M. O. Eldridge, Assistant in Road Economics, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, Bulletin No. 393, U. S. Department of Agriculture, dated Oct. 23, 1916. Paper, 6x9 ins., 86 pp., 36 pages of plates.

Included in this bulletin are the results of studies made during the past five years in eight selected counties in Alabama, Florida, Mississippi, New York and Virginia. After a few pages discussing the general problem, each of the counties is taken up separately and detailed information given on the character of work undertaken, the methods of financing, the management of the work, maintenance methods, the effect of the road improvement on land values and traffic development, and other matters. The text is followed by 36 pages of plates showing roads before and after improvement and maps of the county roads systems studied.

"PROGRESS REPORTS OF EXPERIMENTS IN DUST PREVENTION AND ROAD PRESERVATION, 1915." Bulletin No. 407, U. S. Department of Agriculture. Contribution from the Office of Public Roads and Rural Engineering. Paper, 6x9 ins., 72 pp.

Included in this bulletin are descriptions of new experiments with bituminous macadam, bituminous concrete, bituminous surface treatments, and other bituminous road work in Washington, D. C., Buena Vista, Jupiter, Ocala and West Palm Beach, Fla., Montgomery County, Maryland, and Alexandria County, Virginia, and supplementary reports on previous experimental work in Florida, Iowa, Kansas, Kentucky, Maryland, New York, Ohio and Tennessee. In the presentation and arrangement of the subject matter the bulletin follows previous reports on work of this kind which have been published by the U. S. Office of Public Roads and Rural Engineering.

"HIGHWAYS AND BYWAYS—A PROBLEM IN UPKEEP," Philadelphia, Pennsylvania, Department of Public Works, Bureau of Highways and Street Cleaning. Summary of Operations for the Year 1915. Paper, 6x9 ins., 138 pp.; illustrated.

This publication is the report for the year 1915 of William H. Connell, Chief of the Bureau of Highways and Street Cleaning. It comprises 69 pages of text descriptive of the operations of the bureau and an appendix of about the same number of pages containing detailed descriptions of the Oxford Pike concrete service test road, the Byberry and Bensalem service test road, the installation of planning boards in the Bureau of Highways, and tables of statistics on contracts, street cleaning, maintenance, and other work of the department. The illustrations consist of halftones showing streets before and after improvement, the work of snow removal, street cleaning, and other matters incident to the work of the bureau. A review of an advance copy of the report was printed in an earlier issue of "Good Roads" ("Salient Features of Highway Work in Philadelphia, Pennsylvania, During 1915," "Good Roads," May 6, 1916, page 197).

NEW YORK STATE COMMISSIONER OF HIGHWAYS. Annual Report for 1916. Cloth, 6x9 ins., 939 pp.; illustrated.

Included in this report are the reports of State Commissioner Edwin Duffey, First Deputy Commissioner H. Eltinge Breed, Second Deputy Commissioner Fred W. Sarr, Third Deputy Commissioner Benjamin J. Rice, and Auditor S. D. Gilbert. The reports of the deputy commissioners cover the details of the work of construction, maintenance and repair of state and county highways and the work of the Bureau of Town Highways. There are several appendices of tabular data. The report is illustrated by a number of full-page halftones showing highways before and after improvement, road construction in progress, bridges and incidental highway work. With the report are two large maps showing state, county and town roads and points of historical interest.

BOOK NOTICE

"LABORATORY MANUAL OF BITUMINOUS MATERIALS," by Prevost Hubbard, Chief, Division of Road Material Tests and Research, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Cloth, 6x9 ins., xi + 153 pp. John Wiley & Sons, Inc., New York, N. Y. $1.50.

This laboratory manual, according to the introduction, "is primarily intended as a laboratory guide for the student of highway engineering and not as a treatise upon methods of analyses and tests of bituminous materials. Its object is to describe methods in sufficient detail to enable the student to perform the more common and widely used tests with a reasonable degree of accuracy, provided his work is carefully conducted and he is supplied with the necessary laboratory equipment." The subject matter is presented in three parts, the first consisting of a general treatise on bituminous materials; the second, a detailed description of the methods of testing, and the third, a discussion of the characteristics of the more important bituminous materials. Included in the first part are lists of definitions, classifications of bituminous materials, and other matter. The second part describes density, consistency, heat, solubility and miscellaneous tests, and the extraction of bituminous aggregates and the recovery of bitumen and aggregate. In Part III alternate leaves are left blank for notes.

GOOD ROADS

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NEW YORK, DECEMBER 9, 1916

Number 24

Government Road Work During the Past Fiscal Year

A detailed account of the work of the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture is given in the annual report of the office for the fiscal year ending June 30, 1916, which has recently been made public. The report which is submitted to the Secretary of Agriculture by Logan Waller Page, Director of the office, covers the work of road construction under Vernon M. Peirce, Chief of that division, the work of road maintenance under Chief E. W. James, the work on national park and forest roads under Chief T. Warren Allen, the studies in road economics under Chief J. E. Pennybacker, and the road material tests and research under Chief Prevost Hubbard. There are also included reports on other work performed by the office in rural engineering.

The road construction work of the office included the construction of experimental and post roads, studies of county road systems, superintendence of county roads, special inspection and advice in various localities, and the preparation of bridge plans. The experimental work conducted by the office was described briefly in a recent issue of "Good Roads" ["Government Experimental Road Work in 1915," "Good Roads," Dec. 2, 1916, p. 233].

The work on post roads comprised the continuation of work on the projects undertaken under the provisions of the Post Office Appropriation Act of Aug. 24, 1912. At the beginning of the fiscal year 181 mi. had been completed. Work was continued on the 11 remaining projects, and at the close of the fiscal year 8 were completed in Montgomery and Bath Counties, Ky., Cumberland County, Me., Leflore County, Miss., Forsythe, Davie and Iredell Counties, N. C., Aiken County, S. C., Loudon and Montgomery Counties, Tenn., and Bexar, Guadalupe, Hays, Comal and Travis Counties, Tex. A detailed report on this work will be made to Congress when all the projects are completed.

Studies of existing road systems and recommendations for further work were made in the following counties: Lee, Ala.; St. Francis, Ark.; Bay and Escambia, Fla.; Spencer, Ind.; Baltimore, Md.; Lapeer, Mich.; Harrison, Holmes, Leflore, Sunflower, Tallahatchie, Tate, Washington and Yazoo, Miss.; Cass, Clay, Cooper, Johnson, Howard and Saline, Mo.; Washoe, Nev.; Hood River, Ore.; Perkins, S. D.; Knox and Monroe, Tenn.; Brooks, Hidalgo and Travis, Tex.; Skamania, Wash.; Brooke and Greenbrier, W. Va.

An engineer was assigned to Monroe County, Ind., to cooperate with the local authorities in extensive maintenance work and in the construction of several sections of road.

Special inspection and advice was furnished to local authorities in various communities in Alabama, Arkansas, California, Colorado, Florida, Georgia, Idaho, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Mississippi, Missouri, Nebraska, Nevada, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Virginia, Washington, and West Virginia. In addition three engineers were assigned to assist the Department of Public Roads of Kentucky, and two to the Department of Highways of Tennessee. Another was assigned to assist the state geologist of Georgia in examining the road building materials of the state, and another engineer was assigned to Texas to assist various localities.

Designs of 31 bridges were prepared by the department for communities in Florida, Georgia, Indiana, Maine, North Carolina and Virginia. Engineers were assigned to make investigation of 10 existing and proposed bridges in Indiana, Maine, North Carolina and Virginia, and 12 reports were made on existing and proposed bridges in Kentucky, Maine, North Carolina, Washington and Virginia. Cost estimates of proposed projects to the total number of eleven were made for localities in Florida, Kentucky, Minnesota and Virginia.

During the fiscal year the engineers of the office supervised the construction of 4,942,762 sq. yds. of road including surfaces of cement concrete, bitumnous concrete, bituminous macadam, gravel, sand-clay, and earth roads and surface treatments of various kinds.

Included in the maintenance work of the office was the continuation of the demonstration on the Washington-Atlanta route. Three engineers were employed on this work during the year, each having charge of approximately one-third of the total mileage of about 900 mi. Arrangements were also made with the state highway commissioner of North Carolina and the counties through which the Central Highway passes for demonstration maintenance on that highway.

Other work performed by this division of the office included the maintenance of experimental roads in Montgomery County, Md., and Alexandria County, Va., and of the completed post roads.

The engineers of the division in charge of the national park and forest roads have completed about 127 mi. of reconnaissance surveys and 350 mi. of location surveys during the year. About 160 mi. of road were maintained and about 70 mi. of road built. The work on national forest roads included construction work on 8 projects in district 2, 2 projects in district 3, 9 projects in district 4, 4 roads in district 5, and 7 projects in district 6. In addition, maintenance work was done on between 25 and 30 projects. Most of the work on national forest roads consisted of surveys and inspections.

The road economics division completed a considerable amount of statistical work in the collection of data on road mileage, taxation, revenues, and bond issues. In addition, studies were made of state highway systems, county road management, convict labor, and traffic conditions. The studies in convict labor involved the establishment of an experimental convict camp in Fulton County, Georgia, as well as the collection of data and the study of convict labor in various localities. Under this division of the office is also included the lecture and exhibition work. During the year 655 lectures and addresses were delivered in 46 states by 64 representatives of the office, and exhibits of models and photographs were made at a large number of meetings, including the convention of the American Road Builders' Association at Pittsburgh, Feb. 28 to Mar. 3, 1916, the Panama-Pacific Exposition at San Francisco, Cal., and a number of meetings of state good roads asociations and other organizations. A good roads train was also operated in Iowa.

In the division of road material tests and research, analyses or tests were made on 1,453 samples of road materials. Of these, 474 were examined in the chemical laboratory and 979 in the physical laboratory. In addition to this, routine researches were continued on dust preventives and road binders and on various other technical problems of road construction.

Stanislaus County, California, to Build 126 Miles of Roads

As a result of the recent election, Stanislaus County, Cal., will issue bonds to the amount of $1,500,000 for the purpose of constructing a system of roads.

The plan calls for the surfacing of approximately 126.1 miles of 12-ft. and 16-ft. roads with a $1:2\frac{1}{4}:5$ concrete base of a minimum thickness of 4 ins., and a wearing surface of asphaltic oil and screenings.

County Surveyor E. H. Annear estimates the cost of the work at $1,482,854.72.

Several Michigan Counties Vote Large Bond Issues

A number of the counties of Michigan voted large bond issues for road work at the recent election. Among them were Genesee County, $1,000,000; Calhoun County, $800,000; Ontonagon County, $195,000, and Baraga County, $125,000.

Genesee County issued $500,000 worth of bonds about five years ago, but notwithstanding this fact, the $1,000,000 issue carried by a vote of three to one.

The funds in this county will be expended as follows: $100,000 to build roads laid out under the old system, $450,000 for gravel road extensions and $450,000 for construction of trunk roads.

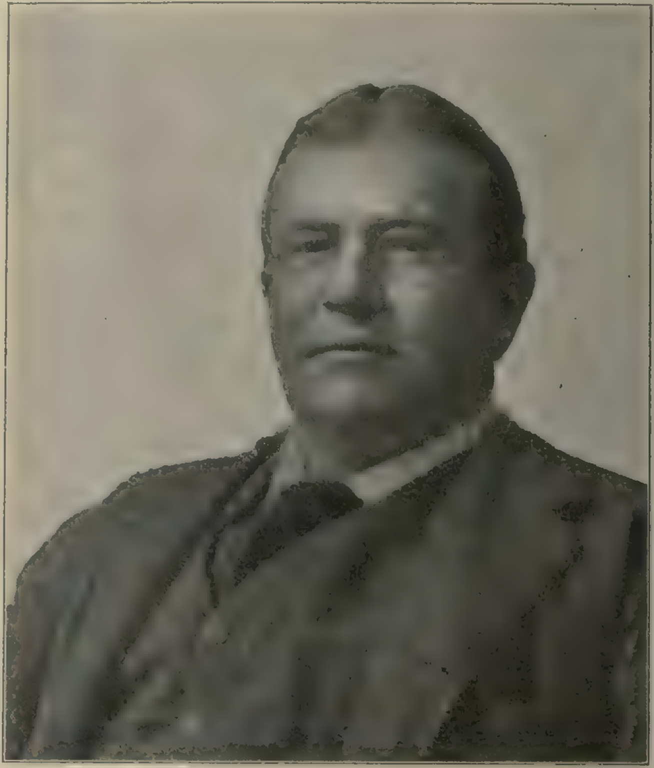
Death of Harold Parker

Harold Parker, former Chairman of the Massachusetts Highway Commission, and a past president of the American Road Builders' Association, died at his home in Lancaster, Mass., on Wednesday, November 29. Mr. Parker's death came after a relatively short illness with angina pectoris.

Mr. Parker was born at Charlestown, Mass., June 17, 1854. He was the son of George Alanson and Harriet Newhall (Felton) Parker, and was descended on his father's side from Capt. Joseph Parker who settled in Newbury in 1638, and on his mother's side from Nathaniel Felton who settled in Salem in 1633. Mr. Parker's early education was obtained in the public schools and later at the Philips Exeter Academy at Exeter, N. H. He attended Harvard University and after leaving there worked as a foreman in the Pennsylvania Steel Works at Harrisburg, Pa. He later became a civil engineer and in 1873 became a member of the firm of Parker & Bateman of Clinton, Mass.

When a young man he was engaged in railroad work in Virginia and Ohio and was subsequently connected with the Pennsylvania Railroad. At different times in his life he was associated with various business organizations, serving as president of the Wonderland Company which was organized in 1906 to build an amusement park at Revere Beach, Mass., and also as president of the Chaffee Brothers Lumber Co. of Oxford, Mass.

Mr. Parker was best known for his activities in the road building field. He was a member of the Massachusetts Highway Commission from August, 1900, to November 1, 1911, being chairman from June, 1908, until his resignation from the commission. He was one of the early members of the American Road Builders' Association, serving as president in 1911 after having been one of the vice presidents of the organization. He also served two terms, 1912 and 1913, as first vice president, and up to his death had been active in the affairs of the association. After his resignation from the state highway commission he became vice president of the Hassam Paving Co. of Worcester, Mass., which position he held at his death. He was also the chairman of the Massachusetts Forestry Commission and had been chairman of the Wachusetts Mountain Reservation Commission. In December, 1915, Mr. Parker associated himself with John A. Bensel and Col. E. W. Van C. Lucas to engage in engineering work, and established offices in New York City.



THE LATE HAROLD PARKER.

Mr. Parker was a member of the American Society of Civil Engineers, the American Road Builders' Association and other organizations. He is survived by his wife, a son and two daughters.

Concrete Pavements in Myers Park, N. C., a suburb of Charlotte, have been finished by dragging an ordinary rubber garden hose over the surface, according to recent reports. The first use of the method is credited to Macon, Ga.

The Automobile Division of the Pennsylvania State Highway Department reports that a total of $131,390 was received for 1917 motor vehicle tags at the close of business November 28. The division has issued notice that it will be closed December 31 and January 1 and that all applications for 1917 licenses should be in before those dates if the owners desire to use their vehicles during January, 1917. The total registration for 1916 was 392,306, and it is said that to date a comparatively small percentage of the holders of registration and licenses have applied for their 1917 permits.

GOOD ROADS

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Meeting of the Kentucky County Road Engineers' Association

As noted in the calendar of meetings, the County Road Engineers' Association of Kentucky will meet at Bowling Green on Wednesday, Thursday, Friday and Saturday, Jan. 17, 18, 19 and 20. The program consists of addresses, papers and discussions at three sessions on Wednesday, three on Thursday, and two on Friday, an illustrated lecture on Friday night and an inspection trip on Saturday. An outline of the program follows:

Jan. 17, forenoon session, W. H. Edwards, County Road Engineer of Woodford County, presiding. Address of welcome, Hon. Alex Patterson, Mayor of Bowling Green; response, J. Russell Gaines, Road Engineer of Jefferson County.

"Object of Meeting," Rodman Wiley, Commissioner of Public Roads of Kentucky.

"Construction of Earth Roads," L. E. Yoder, Road Engineer of Harlan County; discussion led by H. F. Davis, Road Engineer of Whitley County; participated in by Road Engineers, Fred Gesling of Boyd County, J. W. Spurrier of Daviess County, B. J. Calloway of Lawrence County, C. S. Bennett and R. M. Scott of Greenup County, and C. B. Parrott of Knox County.

"Maintenance of Earth Roads," F. L. Duffy, Secretary County Road Engineers' Association; discussion by J. M. Flannigan, Road Engineer of Hopkins County; participated in by W. N. Rees, State Road Inspector of Graves County, Roy J. Sousley, State Inspector of Whitley County; Road Engineers Ed. Butler of Grayson County, Otho Haydon, Jr., of Simpson County, S. M. Bryant of Bell County, B. F. Bacon of Hart County and M. E. Bunch of Butler County.

Afternoon session, J. Russell Gaines presiding.

"Construction of Macadam Roads," Will P. Caldwell, Road Engineer of Boyle County; discussion by R. P. DuValle, Road Engineer of Scott County; participated in by Road Engineers G. C. Donahue of Washington County, J. E. Ratcliffe of Campbell County, Clint Woodward of Jefferson County, R. P. Franks of Hardin County, Sherry B. Smith of Franklin County.

"The Value of Good Roads," Col. Emory G. Dent, Bowling Green.

"Resurfacing of Old Macadam Roads," C. R. Thomas, Division Engineer, Department of Public Roads; discussion by W. H. Edwards; participated in by Road Engineers G. M. Middleton of Shelby County, B. F. Bedford of Bourbon County, Joe S. Boggs of Madison County, E. O. Mills of Kenton County and C. W. Goodridge of Boone County.

"Maintenance of Roads," Col. Harry A. Summers, First Vice President, Kentucky Good Roads Association.

"Tests of Road Building Material," D. V. Terrell, Professor of Highway Engineering, Kentucky University, Lexington.

Jan. 17, night session, G. M. Middleton presiding:

"Good Roads Everywhere," Hon. Chas. Metcalfe, Pineville; "Better Roads in Kentucky," Prof. H. H. Cherry, President, Western State Normal, Bowling Green.

Jan. 18, forenoon session, R. W. Davis, County Road Engineer of Fayette County, presiding:

"Construction and Maintenance of Gravel Roads," W. F. Brooks, U. S. Senior Highway Engineer, Paducah; discussion by J. H. Stone, Bond Issue Engineer of Ballard County; participated in by Road Engineers J. R. Thompson of McCracken County, R. I. Birney of Ballard County, Holly Ford of Graves County, Chas. Folsom (Bond Issue Engineer) of Christian County, Hays Moore of Carlisle County, W. P. Crouch of Gallatin County, Lec Thomas of Union County and P. Hawkins, Civil Engineer of Paducah.

"Trunk Line Highways," Hon. Peter Lee Atherton, President, Jackson Highway Association, Louisville.

"Road Surveys," W. A. Obenchain, Division Engineer, Department of Public Roads, Somerset; discussion by M. D. Ross, Division Engineer, Department of Public Roads, Newport; participated in by Division Engineers of the Department of Public Roads of Kentucky as follows: L. T. Haney of Lebanon, Sherley Cuniff of Louisville, T. B. Webber of Greenup, W. L. McDyer of Paintsville, H. E. Read of Louisville, W. S. Canning of Hopkinsville, C. R. Thomas of Winchester, J. S. Dawson of Lexington and T. B. Smith of Bowling Green.

"Kentucky's Progress in Good Roads Movement," Rodman Wiley; "Good Roads Sentiment," Col. Edmund Watson Taylor, Jr., Vice President, Jackson Highway Association, Frankfort.

Jan. 18, afternoon session, H. H. Denhardt, County Judge of Warren County, presiding:

"County Judges' Relation to Road Movement," J. H. Wade, County Judge of Boyd County; discussion by all county judges present.

"The County Road Engineer," Voris Gregory, County Judge of Graves County; discussion by all county judges present.

"State Aid," J. E. Boltz, County Judge of Campbell County; discussion by all county judges present.

"Road Maintenance," R. C. Hieatt, County Judge of Franklin County; discussion by all county judges present.

"County System of Cost Keeping," Ralph Gilbert, County Judge of Shelby County; discussion by all county judges present.

Jan. 18, night session, Redman Wiley presiding:

"Co-operation Between State and County Officials," Hon. A. O. Stanley, Governor of Kentucky.

Jan. 19, forenoon session, Ed. Butler presiding:

"Resurfacing Roads with Kentucky Rock Asphalt," R. W. Davis; discussion by Col. M. H. Crump, former Road Engineer of Warren County; participated in by J. Russell Gaines, S. R. Murray, Asphalt Expert of Fayette county and C. R. Thomas.

"Good Roads Everywhere," Judge S. B. Dishman of Barbourville.

"Bituminous Roads, Including Mixed and Penetration Methods," S. R. Murray; discussion by R. E. Toms, U. S. Senior Highway Engineer, Corbin; participated in by M. D. Ross, Division Engineer, Department of Public Roads of Kentucky, and Road Engineers R. W. Davis, W. H. Edwards and J. Russell Gaines.

"Bituminous Surface Treatment," R. E. Toms; discussion by S. R. Murray.

Jan. 19, afternoon session, J. W. Spurrier presiding:

"Concrete Bridges," Chas. D. Snead, Bridge Engineer, Department of Public Roads of Kentucky; discussion by J. L. McKee Riffe, Road Engineer of Lincoln County; participated in by J. R. Thompson, C. P. Schneider and E. G. Collins, Bridge Draftsmen of the Department of Public Roads of Kentucky; B. F. Bedford, Road Engineer of Bourbon County; W. R. Tipton, State Road Inspector of Martin County; John B. Wilson, County Judge of Ohio County; D. W. Rider, County Judge of Hardin County; F. H. Yancey, State Road Inspector of Madison County, and W. J. Carroll, Professor of Bridge Engineering, University of Kentucky, Lexington.

"Dixie Highway," Tom Wallace, Editorial Staff, "Courier-Journal"; general road discussion.

The night session of Jan. 19 will be devoted to an illustrated lecture, and all day Saturday, Jan. 20, will be given up to inspecting the rock asphalt fields and roads of Warren and adjacent counties.

COMING MEETINGS

December 11-13—Portland Cement Association—Annual meeting, New York, N. Y. Assistant to General Manager, A. H. Ogle, Chicago, Ill.

December 26-30—American Association for the Advancement of Science—Meeting, New York, N. Y. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 17-20, 1917—County Road Engineers Association of Kentucky—Meeting, Bowling Green, Ky. Secretary, F. L. Duffy, Frankfort, Ky.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill

February 8-10, 1917—American Concrete Institute—Annual meeting, Hotel LaSalle, Chicago, Ill. Secretary, Harold D. Hynes, 1418 Walnut Street, Philadelphia, Pa.

American Road Builders' Association

The committee in charge of the Eighth National Good Roads Show, which will be held in conjunction with the Fourteenth Annual Convention of the American Road Builders' Association in Boston, Mass., during the week beginning February 5, reports a large number of applications for exhibition space.

Among the applicants are a number of the leading motor truck manufacturers, which may be taken as an indication of the growing tendency among highway contractors to use this class of vehicle in their work.

The annual convention of the American Concrete Pipe Association will be held in Chicago, Ill., on Feb. 12, 13 and 14, these dates falling during the second week of the Cement Show. E. S. Hanson, 538 South Clark St., Chicago, is secretary of the associaton.

PERSONAL NOTES

S. J. Humes has been elected County Road Engineer of King County, Wash.

L. O. Morden has been appointed Chief Draftsman of the Oklahoma State Highway Department.

W. A. Wentle has been appointed Assistant County Engineer of El Paso County, Tex., succeeding C. S. Henning, resigned.

A. D. Stivers, formerly County Engineer of Camp County, Tex., has been appointed Superintendent of the Cleveland Trinidad Paving Co., at Galveston, Tex.

Henry Welles Durham, County Engineer of Bergen County, N. J., who has been absent on leave with his regiment, the 7th New York Infantry, at McAllen, Tex., has returned to his office, having been mustered out of active service with his regiment.

Frank Hamilton, Chairman of the Board of County Road Commissioners of Grand Traverse County, Mich., was the guest of honor at a dinner given recently in Traverse City, Mich., by a number of his friends on the occasion of his 68th birthday. Mr. Hamilton was presented with a handsomely engrossed address which bore testimony of his efficiency as a public official.

A Consular Report States that the number of horse-drawn vehicles imported by Martinique, French West Indies, is growing less every year. Small factories on the island import the parts and finish the vehicles. Approximately all imported vehicles and about 75 per cent. of the parts come from the United States. The motor vehicle is rapidly taking the place of the horse-drawn, although comparatively few motor trucks have been imported. The total number of automobiles imported during 1915 was 63, of which 58 came from the United States.

A Uniform Motor Vehicle and Traffic Law is shortly to be promulgated by the legislative board of the American Automobile Association, according to a recent statement from that organization. According to Chairman O. I. Yellott, highway traffic presents but a single problem, whether it consists of horse-drawn vehicles, motor-driven vehicles or pedestrians, and should be regulated by one general set of laws so that the rules governing any particular kind of traffic may be coordinated and consistent with those governing all other kinds. It is stated that while the details of the law have not been fully worked out, it will consist of various subdivisions, each dealing with a particular phase of the problem. The first will contain general provisions relating to the applicability of the law and defining the terms used in it. The second will deal with the appointment, powers and duties of a state traffic commissioner. The third will deal with the regulation of motor vehicles and operators, the fourth with the operation of vehicles of all kinds on public highways and with the conduct of pedestrians on the highways, and the fifth with methods of enforcing the provisions of the law.

GOOD ROADS

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Number
25

Short Course in Highway Engineering at the University of Tennessee

Announcement of a short course in highway engineering offered jointly by the University of Tennessee and the State Highway Department of that state has been made through the Engineering Department of the university. The course will commence on Tuesday, January 2, and will continue for eight weeks. It will be conducted by an engineer detailed from the State Highway Commission, working under the general supervision of the dean of engineering of the university and assisted by the engineering faculty. An outline of the course as furnished by Dean Charles E. Ferris, follows:

Mathematics: A brief review of the algebra and geometry necessary to the study of trigonometry. Trigonometry; a study of circular functions, the use of tables and solutions of problems.

Drawing: This course will be adjusted to the needs of the student, but will lead to the making of maps and profiles from field notes. Much attention will be given to lettering.

Materials Testing: Standard tests of cement, stone, gravel, brick, bituminous material.

Highway Economics: Methods of financing highways, bond issues, system of taxation, methods of maintenance, cost accounting, estimates, contracts and specifications.

Highway Bridges: Selection of type and materials. Calculation of stresses, design of structures. Particular attention will be given reinforced concrete for bridge construction.

Elements of Mechanics: This course will be given without the use of calculus. It is necessary to the engineer who would calculate stresses in bridges.

Surveying: This is an elementary course in the use of instruments, adjusting and repair, methods of taking notes, etc. It is offered for men without field experience.

Highway Machinery: Boilers; engines, steam and oil; pumps; excavating machines; rollers; scarifiers; graders; quarrying machinery.

Highway Construction and Maintenance: Preliminary surveys, grades, drainage. The use of hard surface materials, dust preventives, patrol systems of maintenance.

While the courses outlined are opened to all who attend, students will be registered only in subjects from which they are qualified to receive benefit. A certificate will be issued for each course completed in a satisfactory manner. It is stated that the work is not arranged for university credit, but to meet the immediate needs of road builders. A fee of $2 will be charged for each course with an additional fee of $2 when the course includes laboratory or field work.

Detailed information concerning the course may be secured from Charles E. Ferris, Dean of Engineering, University of Tennessee, Knoxville, Tennessee.

Philadelphia-Camden Toll Bridge

The Philadelphia Bridge Commission will ask for an appropriation to enable it to carry on the work of making definite surveys for the proposed bridge to connect Philadelphia with Camden, N. J. It is claimed by the New Jersey Commission, according to reports, that progress with the plan to construct a bridge to take care of the heavy traffic between the two cities has been delayed by lack of action on the part of those representing the interests of Pennsylvania in the project.

Dedication of the Ceramic Engineering Building at the University of Illinois

The recently completed Ceramic Engineering Building of the University of Illinois, at Urbana, was dedicated on December 6 and 7. The dedication exercises were opened on Wednesday afternoon, December 6, by a meeting of the advisory board of the department followed by a reception in the building.

On Wednesday evening there was a meeting in the university auditorium at which President Edmund J. James presided. Addresses were made by Dr. S. W. Stratton, Director of the National Bureau of Standards, and J. P. Beck, General Manager of the Portland Cement Association. Dr. Stratton spoke on "The Ceramic Resources of America," and Mr. Beck on "Science as an Agency in the Development of the Portland Cement Industries."

On Thursday morning a technical session was held in the university auditorium. It was opened by an address on "The Manufacturer's Dependence upon Ceramic Research" by W. D. Gates, President of the American Terra Cotta and Ceramic Company of Chicago, and was followed by a discussion, by Ross C. Purdy, Research Engineer of the Norton Company, and L. E. Barringer, of the General Electric Co.

The second address of the session was made by W. W. Marr, Chief State Highway Engineer of Illinois, who spoke on "The Use of Ceramic Materials in Highway Construction." Mr. Marr's paper was discussed by Will P. Blair, Secretary of the National Paving Brick Manufacturers' Association, and G. G. Wooley, Engineer of the Road Bureau of the Portland Cement Association. Other papers at this session were "Ceramic Products as Structural Materials" by H. J. Burt, of Chicago, and "The Use of Ceramic Products in the Artistic Embellishment of Buildings" by Claude Bragdon, of Rochester, N. Y.

At the close of this session the speakers and guests of the university were entertained by the dean and heads of departments of the College of Engineering at a luncheon at the University Club.

The formal dedication ceremony was held at the university auditorium on Thursday afternoon, Dean W. F. M. Goss of the College of Engineering presiding. Addresses were made by Governor Edward F. Dunne of Illinois, W. L. Abbott, President of the Board of Trustees of the University of Illinois, and Charles F. Binns, Director of the New York State School of Clayworking and Ceramics. Professor Binns spoke on the topic, "The History of the Ceramic Arts." The exercises were concluded by an address by the president of the university, describing the growth of the Department of Ceramic Engineering. After singing "America," the audience marched to the new building where the prayer of dedication was made by Rev. John Mitchell Page.

Meeting of the American Association of State Highway Officials

The annual meeting of the American Association of State Highway Officials was held at the Hotel Jefferson, St. Louis, Mo., on Tuesday, Wednesday and Thursday, Dec. 5, 6 and 7. The sessions on Tuesday, Dec. 5, and Thursday, Dec. 7, were open only to members of the organization. The session on Wednesday, Dec. 6, which was given over entirely to the presentation of papers and to discussion of topics of technical interest, was open to the public.

Two subjects—federal aid and tests of materials—were considered at the opening session on Tuesday. Discussion on the former was opened by the presentation of the report of the Committee on Standards, W. D. Uhler, Chief Engineer of the Pennsylvania State Highway Commission, chairman. The committee's work not having been completed, a verbal progress report was made, and was followed by discussion.

The matter of tests of materials was introduced by the report of the Committee on Tests and Experimental Work, of which A. D. Williams, Chief State Road Engineer of West Virginia, is chairman. In the report it was pointed out that the amount of money being expended for road work calls for the most careful consideration of all materials and methods employed. It was recommended that in order to carry out its work the committee be divided into the following subdivisions: "(1) Selection and care of samples for testing; (2) investigation of chemical materials; (3) investigation of non-bituminous road materials; (4) investigation of bituminous road materials; (5) committee on traffic census and traffic effects." Further recommendations were made as follows:

1. That insofar as adopted, the standard methods of tests of the American Society for Testing Materials be employed, and that in compiling specifications reference be made to the date of adoption of such standards.
2. That whenever possible and practical, institutions and laboratories doing individual or particular research work publish the results of their findings so as to render such information available to all interested parties.
3. That as soon as possible, results of present investigations by the different departments be ascertained so as to avoid duplication and enable concentration in future efforts.
4. That the representatives of the various highway departments make known their desires and requirements for specific investigation.
5. That this Association consider the determination of the maximum and minimum efficiency requirements of various materials for different classes of construction and that insofar as possible and as fast as practical the Committee on Standards adopt and disseminate such information.
6. That the various states provide adequate facilities and support for conducting investigations of the local materials in the respective states, and that a copy of this report be furnished the Governor and Legislature of the several states.

The open session on Wednesday, Dec. 6, was devoted to the consideration of the general subject of materials of construction. The use of asphalts was discussed by Clifford Richardson of the Barber Asphalt Paving Co., the use of brick by Will P. Blair, Secretary of the National Paving Brick Manufacturers' Association, and the use of concrete by G. A. Ricker of the Portland Cement Association. Culverts were discussed by Howard See of the Dixie Culvert & Metal Co., and D. M. Buck of the American Sheet & Tin Plate Co.

The program for the last session comprised papers and discussions on maintenance, legislation, patents on materials and methods used in road and bridge construction, grade crossings and traffic regulations.

Various resolutions reported by the committee having that matter in charge were adopted. In addition there were adopted two general resolutions. One of these requested Congress to make more liberal appropriations for the completion of the topographical maps, which have been of so much assistance to highway engineers. The other requested the Federal Trade Bureau to investigate alleged illegal practices on the part of individuals holding road patents. The first of the committee's resolutions expressed the organization's gratification at the passing of the federal aid law, thanked the Secretary of Agriculture, the Office of Public Roads and the retiring officials of the American Association of State Highway Officials for their efforts to bring about the passage of the law, and pledged to the Secretary of Agriculture the support of the departments and officials of the organization in carrying out its provisions. The changing of highway officials for political reason was deplored and the passage of laws making such officials independent of politics was urged in the second resolution. The remaining resolutions endorsed convict labor; recommended closer cooperation between the testing departments of the federal government and the states and suggested the holding of a conference of representatives from the laboratories of those departments; recommended that "the various road organizations now in existence endeavor to consolidate or to at least arrange for a single national meeting so as to save time and expense to all citizens and officials," and extended the association's thanks to local organizations and institutions for courtesies received during the meeting.

First Annual Meeting of the Paving Brick Institute

The first annual meeting of the Institute of Paving Brick Manufacturers was held at the Hotel Statler, Cleveland, Ohio, on December 5 and 6. The attendance was large.

The following papers were read and discussed: "Producer Gas in Burning Brick," by John T. Underwood, inventor of the Underwood producer gas burning system; "Equipment Efficiency," by F. R. Kanengeiser, of the Bessemer Limestone Co., Youngstown, Ohio; "Labor," by George D. Orr, of the Purington Paving Brick Co., Galesburg, Illinois; "The Development and Application of a Bonus System," by S. M. Duty, of the Medal Paving Brick Co., Cleveland, Ohio.

The following officers were reelected: President, F. R. Kanengeiser, of the Bessemer Limestone Co., Youngstown, Ohio; Vice President, S. Coles Peebles, of the Peebles Paving Brick Co., Portsmouth, Ohio; Treasurer, O. W. Renkert, of the Metropolitan Paving Brick Co., Canton, Ohio. H. H. Macdonald, Assistant Secretary of the National Paving Brick Manufacturers' Association, Cleveland, Ohio, was elected secretary.

The Northwestern Road Congress

The third annual meeting of the Northwestern Road Congress was held at Chicago, Ill., on December 7 and 8.

The sessions were held at the Hotel Sherman. Two sessions for the presentation of papers and for discussion were held on the first day of the meeting. In the evening moving picture films of road building operations were shown.

One of the chief recommendations embodied in the resolutions adopted by the congress urged the extension of the state aid policy. Other resolutions favored the utilization of convict labor in road building, the employment of competent men without political interference, and the providing of opportunities for the study of road building in technical schools.

Officers for the coming year were elected as follows: President, A. D. Gash, Chairman, Illinois State Highway Commission; Vice President, Frank F. Rogers, State Highway Commissioner of Michigan; Secretary-Treasurer, T. R. Agg, Professor of Highway Engineering at the Iowa State College; Directors, J. A. Hazelwood, Chairman, Wisconsin State Highway Commission; S. A. Bradt, Secretary, Illinois State Highway Commission; John H. Mullen, Deputy Engineer, Minnesota State Highway Commission; H. N. Johnson, of Ishpeming, Mich.; T. R. McDonald, of Ames, Ia.; H. F. Holman, of Moberly, Mo.

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Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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The submission of articles by engineers, contractors and others engaged in road and street work is invited. All articles should be short and should be accompanied by photographs if possible. Accepted articles will be paid for at current rates.

Bids for Road Work in Butler County, Ohio

The following bids for road improvement have been received by the Board of County Commissioners of Butler County, Ohio:

Hamilton and Carthage pike, 5.97 mi. water bound macadam, $56,534.54; brick, $124,190.66.

Hamilton and Middletown pike, 3.18 mi.; water bound macadam, $36,358.64; brick, $69,743.60.

Hamilton and Scipio road, 1.44 mi.; water bound macadam, $21,719.66; brick, $41,576.52.

Middletown and Franklin pike, 3.54 mi.; water bound macadam, $40,000; brick, $77,600.

Annual Meeting of the Safety First Federation

The annual meeting of the Safety First Federation was held at Baltimore, Md., on Thursday, Friday and Saturday, December 7, 8 and 9.

Many of the papers and much of the discussion at the meeting were devoted to the subject of traffic, among the speakers being Darwin P. Kingsley of New York, President of the organization, Marshal of Police Carter of Baltimore, Police Commissioner Arthur Woods of New York City, Dr. H. M. Rowe, President of the American Automobile Association; Maj. Raymond W. Pullman, Superintendent of the Police Department of Washington, D. C.; Lawrence G. Brooks, Secretary-Treasurer of the Highway Safety League; Henry L. Rose, Deputy Commissioner of Motor Vehicles of Maryland, and Harold W. Newman, Commissioner of Public Safety of New Orleans, La.

On Monday, December 11, the board of directors of the federation met in New York City and elected officers for the coming year as follows: President, Darwin P. Kingsley, New York, N. Y.; 1st Vice President, Harold W. Newman, New Orleans, La.; 2nd Vice President, C. M. Talbert, St. Louis, Mo.; 3d Vice President, to be filled later; 4th Vice President, Dr. Gardner T. Swarts, Providence, R. I.; Treasurer, Chas. L. Bernheimer, New York, N. Y.; Secretary, Francis X. Butler, New York, N. Y.; General Counsel, Wm. Bondy, New York, N. Y. Executive Committee: Darwin P. Kingsley, Harold W. Newman, C. Loomis Allen, Syracuse, N. Y., Chas. L. Bernheimer, Dr. Edgar D. Thompson, Washington, D. C., Lawrence G. Brooks, Boston, Mass., Frederick H. Elliott, New York, N. Y.

Meeting of the Portland Cement Association

A quarterly meeting of the Portland Cement Association was held at New York, N. Y., on Monday, Tuesday and Wednesday of this week. The meeting was devoted to the receipt of committee reports and the transaction of business of interest to the Portland cement industry.

On Wednesday evening a banquet was held at which the speakers were John Kendrick Bangs, A. W. Thompson, Vice President of the Baltimore & Ohio Railroad, and Richard Hardy, President of the Dixie Portland Cement Co., of Chattanooga, and one of the promoters of the Dixie Highway.

Incorporation of the Alabama Good Roads Association

The incorporation of the Alabama Good Roads Association under the laws of Alabama was authorized at the annual meeting of the organization held at Birmingham, Nov. 15 and 16 and noted briefly in "Good Roads" for Nov. 25.

The necessary steps have now been taken and the organization has been made an incorporated body with power to maintain suitable quarters for its members and guests in the city of Birmingham, to engage in, promote or assist in public undertakings, and to engage in any legitimate work for furthering the objects of the organization. Among the incorporators are J. A. Rountree, Secretary of the Association, Senator John H. Bankhead, Lieut. Governor Thomas E. Kilby, Senator Oscar Underwood, State Highway Commissioner John Craft, and others.

Death of Jesse Taylor

Jesse Taylor, Editor of "Better Roads and Streets," died at his home at Jamestown, Ohio, on December 6. He had been in poor health for some time and his death had been expected for about a week. Bright's disease and an abnormally high blood pressure were the immediate causes, although he had suffered two paralytic strokes, the first nearly four years ago.

Mr. Taylor was born in Jamestown on February 22, 1864. He received his education in the public schools and Antioch College, and after graduation entered a lawyer's office to study law. He was admitted to the bar in 1886 at Winfield, Kan., where he had moved for his health. He became prosecuting attorney of the county and later probate judge. He was made receiver of public moneys at the U. S. Land Office at Garden City, Kan., during President Harrison's administration and continued in that office until the election of Grover Cleveland, when he returned to Jamestown. In 1890 he became cashier of the People's Bank at Jamestown holding that position until he succeeded his father-in-law, John G. Clemens, as president, on the latter's death last June.

In 1911 Mr. Taylor established "Better Roads." Besides serving as editor of that publication he took an active part in road propaganda work, making many addresses at good roads meetings and similar gatherings. At the time of his death he was president of the Ohio Good Roads Federation and secretary of the Interstate Stone Association.

COMING MEETINGS

December 26-30—American Association for the Advancement of Science—Meeting, New York, N. Y. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 17-20, 1917—County Road Engineers Association of Kentucky—Meeting, Bowling Green, Ky. Secretary, F. I. Duffy, Frankfort, Ky.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

February 8-10, 1917—American Concrete Institute—Annual meeting, Hotel LaSalle, Chicago, Ill. Secretary, Harold D. Hynes, 1418 Walnut Street, Philadelphia, Pa.

February 19-24, 1917—South Western Concrete Association—Annual meeting and show, Kansas City, Mo. Chairman of committee, Charles A. Stevenson, 1433 West 10th St., Kansas City, Mo.

A good roads convention is being arranged by the Fergus Falls (Minn.) Commercial Club for some time in January. The object of the meeting will be to awaken interest in road improvement generally, and to discuss the laying out of special highways that, it is claimed, are now greatly needed.

At a recent meeting of the directors of the International Jefferson Highway Association at Muskogee, Okla., it was agreed to hold the annual convention of the association at St. Paul in June, 1917. The following officers were elected at the Muskogee meeting: President D. N. Funk, Muskogee; Vice President, W. A. Hopkins, Des Moines, Ia.; Treasurer, F. J. Wright, Des Moines; Secretary, Walter Parker, New Orleans.

MEETINGS

Massachusetts Highway Association

Candidates for office for 1917 have been selected by the Nominating Committee of the Massachusetts Highway Association as follows:

For President: Oscar C. Starkweather, Wakefield; John A. Williams, Framingham; Herbert C. Wilson, Worcester.

For Vice President: Harry P. Burden, Somerville; William J. Gannon, Fitchburg; James H. Johnston, Leominster.

For Secretary: Thomas F. Cook, Brookline; Irving E. Johnson, Weymouth; John M. McCarthy, Natick.

For Treasurer: Charles A. Brown, Wellesley; G. Arthur Wells, Worcester; Arthur H. Woodward, Springfield.

For Directors: James W. Blackmer, Beverly; John A. Gaffey, Medford; William P. Hammersley, New Bedford; Frank B. Manning, Fall River; Henry A. Spates, Milton; Elwin S. Warner, Greenfield.

Minnesota Jefferson Highway Association

At a good roads meeting held at St. Paul recently, at which were represented 18 of the 21 counties through which the Jefferson Highway passes, the Minnesota Jefferson Highway Association was organized. The action was a part of the plan of the state to take advantage of its apportionment under the new federal aid law. J. H. Beek, of St. Paul, was elected president of the new organization. Mr. Beek pointed out that with the exception of a few stretches the highway in Minnesota was in fair condition. A special committee was appointed to cooperate with the State Highway Commission and look after the interests of the highway at the next session of the legislature.

The Grady County Highway Association was organized at Chickasha, Okla., on Dec. 1, in the interest of road improvement in the county, and for the special purpose of furthering the construction of the Ozark Trail. The following officers were elected: President, E. C. Burton; Vice President, John T. Owsley; Treasurer, Ben Johnson; Secretary, Conde McGinley.

A branch of the Bankhead Interstate Highway Association was organized at Beaverton, Lamar County, Alabama, on December 1. The object of the Lamar County organization is to construct a road from Guin to Sulligent to form a connecting link in the Birmingham to Memphis route. The cost of construction is to be paid for by private subscription.

PERSONAL NOTES

A. J. Egloff has been appointed Deputy Commissioner of Parks and Public Buildings of Buffalo, N. Y.

Max L. Cunningham, Consulting Engineer, Oklahoma City, has been appointed State Engineer of Oklahoma.

J. C. Clausen has resigned from the staff of the City Engineer of Los Angeles, Cal., to engage in private practice.

J. A. Jordan has been appointed Assistant City Engineer in charge of street construction inspection of Los Angeles, Cal.

E. H. Davis, Road Supervisor of Spalding County, Georgia, has resigned to join the engineering staff of the State Highway Commission.

A. R. Ross has resigned as Engineer in Charge of the St. Louis Municipal Bridge to become a partner in the contracting firm of Ross, Robertson & Miller.

F. O. Sinclair, City Engineer of Burlington, Vt., died at that city on November 15. Mr. Sinclair was a past president of the Vermont Society of Civil Engineers.

Edward M. Bigelow has been appointed Director of the Department of Public Works of Pittsburgh, Pa., to fill the vacancy caused by the death of Robert Swan. Mr. Bigelow was formerly State Highway Commissioner of Pennsylvania, and has long been identified with the engineering affairs of Pittsburgh.

Raymond W. Parlin, of the Bureau of Municipal Research, New York City, has been appointed Deputy Commissioner of the Department of Street Cleaning of New York City, under Commissioner John T. Fetherston. Mr. Parlin studied engineering at the Massachusetts Institute of Technology and for a time was connected with the Massachusetts State Board of Health. He is a member of the American Society of Civil Engineers, the American Society of Municipal Improvements, the American Water Works Association and the Boston Society of Civil Engineers.

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Proposed Bill for a State Highway Department in Texas

In a recent bulletin of the Agricultural and Mechanical College of Texas, entitled "The Organization of a State Highway Department for the State of Texas," and written by B. K. Coghlan, Assistant Professor of Highway Engineering at the college, is a proposed bill for the establishment of a state highway department. The main provisions of the bill stated briefly are as follows:

Provision is made for the establishment of a state highway commission consisting of five members. One of these is to be a professor in the Civil Engineering Department of the Agricultural and Mechanical College of Texas, and one the Director of the Bureau of Economic Geology and Technology at the University of Texas. The other three members are to be appointed by the governor. The members of the commission are to serve without salary but are to be allowed their expenses. The commission is to effect its own organization and is to meet regularly in March, June, September and December and whenever special meetings may be called.

The state highway commission is directed to select a state highway engineer, who must be a graduate civil engineer experienced in highway work. He is to receive a salary of not over $6,000 a year, and is to act as administrative head of the state highway department.

The duties of the state highway commission are to determine the general policy of the state highway department, leaving the actual direction of the work to the state highway engineer. The duties of the state highway engineer are to include the making of a general highway plan of the state; the collection of information and the compilation of statistics relative to the mileage, condition and character of the roads in the state; the investigation of methods of road and bridge construction best adapted to various sections of the state; consultation with the county officials regarding road and bridge work; the prescribing of a system of auditing and accounting for all road and bridge moneys used by county officials, and the rendering of quarterly and annual reports to the commission.

The state highway commission is expressly authorized to cooperate with the federal government in the expenditure of federal aid funds. It is also authorized to pay out and establish public roads and highways, acquiring rights of way by condemnation if necessary. It is also authorized to take from lands adjacent to or accessible from any public road such construction materials as may be necessary, paying the owners therefor at an agreed price, or on failure to agree, paying the damages.

It is made mandatory upon county and other local officials to cooperate with the state highway engineer in the collection of information and to use the auditing and accounting system prescribed by him. The proposed bill also provides that it shall be the duty of county and other local officials to advise with the state highway engineer upon the expenditure of road and bridge funds at their disposal, and that no contract for road and bridge construction, improvement or maintenance exceeding $10,000 may be awarded until the contract and the specifications have been approved by the state highway engineer.

One section of the proposed bill provides for the appropriation of funds for the administration of the state highway department.

Alternate sections of the bill are provided to take the place of the section providing for appropriations, in case it is found advisable to enact a bill carrying with it a provision for a tax upon motor vehicles. These sections provide for the registration of motor vehicles and for the payment of a registration fee of $1 for each motorcycle and $3 for each motor vehicle of other types. These fees are to be deposited to the credit of the state highway fund and are to be used for carrying out the provisions of the bill creating the department.

Report on Minnesota State Highway Commission Bridge Plans

Certain Minnesota newspapers having made the construction of a bridge in Fairmount Township the basis of an attack upon the efficiency of the Minnesota State Highway Commission, the Civil Engineers' Society of St. Paul appointed a committee to investigate and report on the matter. The report, signed by L. P. Wolff, W. E. King and W. C. Armstrong, the members of the committee, was printed in the December number of the "Bulletin" of the Affiliated Engineering Societies of Minnesota.

The commission, according to the report often furnishes plans for bridges that are not on state roads and also inspects construction work on non-state roads when requested by the local authorities to do so and when the limited funds at its disposal permit it. In this case the bridge is on a road which is not a state aid road and over which, therefore, the commission has no control. One end of the bridge is in the City of Fairmount and so under the jurisdiction of the city authorities, while the rest of the bridge being outside of the city limits is under the control of the county commissioners.

The State Highway Commission, the committee found, was requested by the county commissioners to furnish plans for the structure. Upon receipt, the plans were turned over to the city authorities, who let the contract and supervised the work without consulting the commission as to the price, the materials and methods used, the acceptance of the bridge or the payment for the work.

After a careful investigation the committee of engineers found that the commission's plans were "worked out in accordance with good engineering practice." An estimate made by the committee and characterized by it as "conservative" placed the cost of the bridge at $5,000, this figure providing "a liberal profit to the contractor." The actual contract price was found to have been $6,600 and the actual cost, including "extras," $7,657.77. "It is evident," in the words of the report, "that the work was let at an exorbitant figure, and the extras allowed made the total cost more exorbitant." It was the opinion of the committee that there were no local conditions that should have made the actual cost so greatly in excess of the estimate and that the excess was "due to a lack of business judgment in letting the contract, the adoption of inefficient methods of work or the absence of proper supervision." A deficiency in each of those particulars contributed to the final result, in the opinion of the committee, which, it was stated, was reliably informed that the work was done very poorly.

In the light of its investigations the committee found that the newspaper criticism was "wholly unjustified" and in order to prevent, so far as practicable the recurrence of such criticism under similar conditions, it recommended:

"(1) That it be established as the policy of the State Highway Commission that plans for bridges shall not be furnished except where the Highway Commission is provided with authority and sufficient funds to maintain adequate superintendence over the letting of contracts, the construction and final acceptance of the work.

"(2) That no state aid be furnished for any bridge work for which for any reason the Highway Commission is unable to furnish superintendence as above outlined."

Death of Edward M. Bigelow

Edward M. Bigelow, who for many years was connected with public affairs in Pennsylvania and who was recently appointed Director of Public Works of Pittsburgh, died at the Allegheny Hospital in that city recently.

Mr. Bigelow was born in Pittsburgh Nov. 6, 1850. He received his engineering education at the Western University of Pennsylvania, which is now the University of Pittsburgh, and left his studies to engage in the work of civil engineering. Later he became Engineer in Charge of Surveys of the City of Pittsburgh, and in 1880 was made City Engineer. In 1888 he was appointed Director of Public Works, and a year later was made director of Schenley and Highland Parks. From 1903 to 1906 he again became Director of Public Works, and later was the consulting engineer of Allegheny County.

In July, 1911, he was appointed State Highway Commissioner of Pennsyvania, which position he occupied until April, 1915.

Removal of Advertising Signs from Illinois State Highways

The State Highway Commission of Illinois recently issued an order to county engineers and sign companies for the immediate removal of advertising signs from state aid roads. W. W. Marr, Chief State Highway Engineer, sent out the following letter on the subject to sign companies:

"The State Highway Commission has just recently issued an order requiring the removal of all advertising signs from the right of way of all state aid roads. I take this opportunity of notifying you of such action in order that you may have an opportunity to remove any such signs in which you may be interested before they are destroyed and in order that all future signs or advertisements which you may have occasion to erect may be placed outside the right of way lines.

"You may not be responsible for any such signs or advertisements, but I trust you will lend your support and bear with us in our efforts to rid the main thoroughfares of what is rapidly becoming a nuisance to the traveling public."

San Jacinto, California, Will Improve Streets

The plan to connect the streets of San Jacinto, California, with the concrete highway system of Riverside County has been successful through the issue of bonds to the amount of $28,000. It is proposed to use this amount for the construction of 3½ mi. of streets extending to the city limits.

Permit for Vehicular Tunnel Between New York and New Jersey

The War Department has issued a permit to the New Jersey Interstate Bridge and Tunnel Commission to build a tube for the accommodation of vehicular traffic between New Jersey and New York. The location of the tunnel, according to the report is from the foot of Canal St., Borough of Manhattan, New York City, to 13th St., Jersey City.

The permit requires that the tunnel shall be located at least 50 ft. below mean low water. The plans are said to call for twin tubes and the estimated cost is placed at $11,000,000. The granting of the permit marks one more step in the effort to obtain a tunnel exclusively for vehicular traffic under the Hudson between the two states. According to the reports, the boards of freeholders of Bergen and Hudson Counties have already approved the plan while the Essex County board will probably vote upon the matter again, the vote last summer having resulted in a tie.

Detailed Vote on the California Road Bond Issue

In the accompanying table, furnished by the California State Highway Commission, is shown the detailed vote by counties on the $15,000,000 bond issue carried at the recent election. There is also shown the vote on the $18,000,000 bond issue in 1910.

TABLE SHOWING VOTE BY COUNTIES ON THE 1910 AND 1916 BOND ISSUES.

	$18,000,000 Bond Issue, 1910.		$15,000,000 Bond Issue, 1916.		
County.	For.	Against.	For.	Against.	Ratio (to 1).
Alameda	10,199	5,328	63,268	11,561	5.47
Alpine	28	3	49	5	9.80
Amador	304	364	1,655	288	5.74
Butte	1,557	831	5,195	1,427	3.64
Calaveras	454	420	1,321	399	3.31
Colusa	408	398	1,516	458	3.31
Contra Costa	1,275	782	7,513	1,653	4.55
Del Norte	193	39	739	37	19.97
El Dorado	1,608	283	1,576	431	3.65
Fresno	2,092	2,843	12,325	5,958	2.06
Glenn	848	285	1,761	515	3.42
Humboldt	1,300	1,000	6,102	1,811	2.17
Imperial	326	365	4,549	378	12.03
Inyo	442	118	1,413	144	9.81
Kern	1,361	543	9,346	1,103	8.47
Kings	401	659	3,552	737	4.81
Lake	293	319	1,414	244	5.79
Lassen	229	160	1,251	260	4.81
Los Angeles	7,665	26,954	126,361	39,485	3.20
Madera	312	156	1,732	464	3.73
Marin	1,458	539	5,788	788	7.35
Mariposa	185	106	818	139	7.35
Mendocino	968	608	3,269	1,513	2.16
Merced	533	359	3,401	614	5.54
Modoc	274	122	1,045	333	3.13
Mono	84	29	169	37	4.56
Monterey	1,183	520	5,193	885	5.86
Napa	645	750	3,742	1,213	3.08
Nevada	905	436	3,328	299	11.14
Orange	555	2,107	9,382	3,575	2.62
Placer	1,180	406	2,892	816	3.54
Plumas	240	174	815	201	4.05
Riverside	635	1,896	7,230	2,386	3.03
Sacramento	5,284	1,385	14,565	2,298	6.34
San Benito	309	372	1,768	552	3.20
San Bernardino	1,463	2,451	10,840	4,490	2.41
San Diego	1,665	3,384	18,943	3,758	5.04
San Francisco	22,685	8,153	93,705	16,647	5.63
San Joaquin	2,028	2,469	10,662	4,024	2.64
San Luis Obispo	958	537	4,913	667	7.36
San Mateo	1,549	542	5,758	1,163	4.95
Santa Barbara	1,292	577	6,295	945	6.66
Santa Clara	3,467	2,106	18,164	5,544	3.27
Santa Cruz	1,084	935	6,028	1,159	5.20
Shasta	974	453	3,000	782	3.83
Sierra	289	74	507	90	5.63
Siskiyou	1,081	367	3,028	1,004	3.02
Solano	1,392	546	5,923	919	6.45
Sonoma	2,250	1,797	9,787	4,650	2.10
Stanislaus	1,147	599	5,210	1,679	3.10
Sutter	332	289	1,243	524	2.37
Tehama	491	477	2,607	655	3.98
Trinity	231	187	767	116	6.61
Tulare	1,112	1,282	7,674	3,125	2.46
Tuolumne	526	328	1,561	367	4.25
Ventura	498	723	4,278	623	6.87
Yolo	883	409	3,213	777	4.14
Yuba	667	165	2,090	392	5.33
Totals	93,297	80,509	542,239	137,107	3.96
Total vote	173,806		679,346		
Plurality for bonds	12,786		405,132		

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Meeting of the Massachusetts Highway Association

A special meeting of the Massachusetts Highway Association was held at the City Club, Boston, Mass., on the evening of Tuesday, Dec. 19.

One of the matters taken up at the meeting was the report of the committee appointed at the November meeting to arrange for the entertainment of delegates to the convention of the American Road Builders' Association Feb. 5 to 9. (Note of the appointment of this committee and a list of the members were printed in "Good Roads" for Dec. 2.) The committee presented its report and was authorized by the association to expend a liberal sum for the entertainment of delegates.

An invitation to attend the meeting was extended to the commissioners appointed by the governor in 1915 to investigate matters pertaining to highways and bridges and to prepare a codification and revision of the highway and bridge laws of the state. These commissioners were represented at the meeting by Col. Wm. D. Sohier, Chairman of the Commission and of the Massachusetts Highway Commission, and Commissioners Frank D. Kemp and James W. Synan of the Massachusetts Highway Commission.

Technical matters discussed at the meeting included the manner of appointing superintendents of highways, the proposed tenure of office, economical methods of expending funds appropriated, new street construction, the increase in automobile traffic and the regulation of motor truck traffic. Among those who participated in the discussion were:

A. T. Rhodes, Street Commissioner, Worcester; Fred Clark, Superintendent of Streets and Engineering, Springfield; Fred E. Ellis, Melrose; R. S. Ellis, Superintendent of Streets, Falmouth; Charles F. Knowlton, Treasurer, Simpson Brothers Co., Boston; William T. Becker, Boston; Michael Driscoll, Superintendent of Streets, Brookline; David Livingston, Superintendent of Streets, Dedham; C. F. Allen, late Professor of Civil Engineering, Massachusetts Institute of Technology; Selectman White, of Stoneham; John N. Keyes, Chairman of Selectmen and Road Commissioner, Concord; Superintendent Worcester of Roads and Bridges Department, Concord; Henry A. Spates, Superintendent of Streets, Milton; John A. Gaffney, Medford; William P. Hammersley, Superintendent of Streets, New Bedford; John A. Johnston, Division Engineer, Massachusetts Highway Commission, Springfield; Geo. C. Warren, President, and James Head, of Warren Brothers Company; Asa B. Prichard, Street Commissioner, Somerville; G. O. W. Service, Superintendent of Public Works, Melrose; Charles P. Price, American Tar Co., Boston.

Meeting of the Motor Truck Club

Police Commissioner Arthur Woods and Street Cleaning Commissioner John T. Fetherston, of New York City, were speakers at a meeting of the Motor Truck Club of America held at the house of the Automobile Club of America on Wednesday evening, Dec. 20.

Commissioner Woods discussed the motor traffic problem of the city, pointing out the necessity for safeguards and suggesting certain precautions for the owners and operators of motor trucks. Commissioner Fetherston spoke on snow removal.

Plans for the Convention of the American Road Builders' Association

Plans for the entertainment of delegates in attendance at the fourteenth annual convention of the American Road Builders' Association at Boston, Mass., on Feb. 5, 6, 7, 8 and 9, are well along toward completion, and indicate that at Boston more attention will be paid to this phase of the meeting than at any of the previous conventions of the association.

According to present plans the exhibition will be opened on the evening of Monday, Feb. 5.

On Tuesday evening the delegates will be entertained by the Massachusetts Highway Association. As is noted elsewhere on this page, a committee appointed by that organization presented a report at a special meeting on Tuesday of this week and was authorized to make liberal expenditures to provide suitable entertainment. While the program for the evening has not been completed, Convention Hall on St. Botolph St., one block from Mechanics' Hall, where the convention will be held, has been secured. It is planned to begin the entertainment at about half-past seven in the evening and continue it as long as the delegates desire. Refreshments will be served during the evening. The Tufts College Glee Club will be among the entertainers.

The annual dinner of the American Road Builders' Association will be given on Wednesday evening.

Lee County, Florida, Votes $190,000 for Dixie Highway

The citizens of Lee County, Florida, on Nov. 23 voted seven to one for the issue of bonds to the amount of $190,000.

The money received from the sale of the bonds will be used, it is stated, to complete the construction of the Dixie Highway passing through Lee County. The action of the Lee County citizens follows the plans previously made by other Florida counties for improving sections of the Dixie Highway.

COMING MEETINGS

December 26-30—American Association for the Advancement of Science—Meeting, New York, N. Y. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 17-20, 1917—County Road Engineers Association of Kentucky—Meeting, Bowling Green, Ky. Secretary, F. L. Duffy, Frankfort, Ky.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

February 8-10, 1917—American Concrete Institute—Annual meeting, Hotel LaSalle, Chicago, Ill. Secretary, Harold D. Hynes, 1418 Walnut Street, Philadelphia, Pa.

February 19-24, 1917—Southwestern Concrete Association—Annual meeting and show, Kansas City, Mo. Chairman of committee, Charles A. Stevenson, 1433 West 10th St., Kansas City, Mo.

The Municipal Engineers of the City of New York

The regular meeting of the Municipal Engineers of the City of New York will be held in the Engineering Societies Building, New York City, at 8.15 p. m., Wednesday, Dec. 27.

Jay Downer, Engineer and Secretary of the Bronx Parkway Commission, State of New York, will present a paper entitled "The Bronx River Parkway." The paper will be illustrated by lantern slides. Refreshments will be served after the meeting.

Southwestern Concrete Association

As is announced in the list of coming meetings, the meeting and exhibition of the Southwestern Concrete Association will be held at Convention Hall, Kansas City, Mo., Feb. 19-24. The program has not yet been announced, but it is stated that one day is to be devoted to the subject of concrete roads. The main floor of Convention Hall has an area of 20,000 sq. ft., and it is stated that 64 manufacturers of cement, cement products and machinery made applications for space at the first drawing.

American Wood-Preservers' Association

Nominations for officers and committeemen of the American Wood-Preservers' Association for 1917 are given below. These are corporate members of the association. The election will take place at the annual meeting of the association which will be held at the Hotel Astor, New York City, Jan. 23-25.

President, John Foley; First Vice President, M. K. Trumbull; Second Vice President, J. B. Card; Secretary-Treasurer, F. J. Angier.

Executive Committee (3 years): V. K. Hendricks and C. M. Taylor.

Nominating Committee: W. A. Fisher, E. T. Howson, R. V. Look, F. D. Mattos, August Meyer and A. H. Noyes.

PERSONAL NOTES

Gordon Smith has been elected County Surveyor of Ada County, Idaho.

Oliver C. Sheley has been elected County Engineer of Jackson County, Missouri.

W. T. Pierce, of Rupert, Idaho, has been elected County Surveyor of Minidoka County.

S. R. Batson has been elected County Highway Engineer of Jefferson County, Alabama.

J. W. Gwinn, former County Engineer of Jefferson County, Alabama, has been elected President of the County Board of Revenue.

Caleb Berry, whose appointment as City Engineer of Centralia, Wash., was noted in "Good Roads" of April 29, 1916, has been engaged to make irrigation surveys near Centralia.

Robert S. Beard has been appointed Acting Assistant City Engineer of Kansas City, Mo., to succeed Clark R. Mandigo, who recently resigned to go with the Portland Cement Association.

Frank A. Nikirk has received the temporary appointment of Assistant City Engineer of San Jose, Cal. Permanent appointment will be made later under the civil service regulations.

TRADE NOTES

Blaw Steel Construction Co. Sales Convention

The annual sales convention of the Blaw Steel Construction Co., Pittsburgh, Pa., was held on Friday and Saturday, November 17 and 18 in Pittsburgh. As last year proved to be by far the most prosperous in the company's history, and present indications are that next year will greatly exceed it, much enthusiasm was evidenced at all times.

Friday morning was devoted to a tour of the plant, and brief addresses were made by Mr. McArthur, Chief Engineer; Mr. Rawley, General Superintendent, and Mr. Loxterman, Manager of the Service Department.

The new Blaw bucket was the topic in the afternoon, as well as on Saturday morning. The many features of the bucket were detailed by Mr. McWhirk, who is in charge of the Bucket Department.

As has been the custom, the convention ended with a banquet at the Concordia Club. More than 60 men were present.

The Asbestos Protected Metal Co., Pittsburgh, Pa., announces the appointment of Meyer Davis, formerly Chief Engineer, as manager of the company's San Francisco, Cal., office, which is located in the Hobart Building.

The Nash Motors Company of Kenosha, Wis., has announced that the production of the Jeffery Quad is to be materially increased to meet the growing demand. It is stated that there are at present over 4,000 Quads in daily use in 55 lines of trade, and that the machines are used in 23 different foreign countries. The truck, it is stated, is used extensively in the European war and is also used by the United States Army. An illustrated description of the use of the Quad on the Mexican Border was printed in "Good Roads" for Oct. 7.

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NEW YORK, DECEMBER 30, 1916

Number
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Proposed Texas Highway Legislation

Some time ago the Texas Good Roads Association appointed a legislative committee to draft a bill for submission to the legislature providing for the establishment of a state highway department. A bill has recently been prepared and made public. [Another bill, proposed by B. K. Coghlan, Assistant Professor of Highway Engineering at the Agricultural and Mechanical College of Texas, was printed in "Good Roads" for Dec. 23.] Stated briefly the provisions of the Texas Good Roads Association bill are essentially as follows:

A state highway department is created and its administrative control vested in a highway commission and a state highway engineer. The commission is to be appointed by the governor with the consent of the senate and is to consist of three members holding office for six years, except that the first commission is to consist of one member appointed for two years, one for four years, and one for six years. The chairman of the commission, who is to be appointed by the governor, is to receive a salary of $4,000 a year and the other two members $2,500 each.

The duties of the commission are to formulate plans for the location, construction and maintenance of roads in cooperation with the counties, the direct charge of the work devolving upon the state highway engineer employed by the commission.

The department must collect information and prepare statistics on road conditions in the various counties; establish standards for the construction of roads, bridges and culverts, and advise with county road authorities. The highway engineer is directed to prepare a complete road map of the state and county authorities are also directed to prepare road maps in duplicate, one copy of which from each county is to be transmitted to the highway commission with recommendations as to the roads which should form a part of a state highway system.

The law also provides that "The commission may offer a scale of rewards to such counties as wish to build permanently constructed roads, rewards to be, as far as possible, graduated with reference to the character and construction and durability of material employed. Recognition shall be accorded to counties in the order of smallest population and assessed valuation and which are least able to construct the more permanent highways, but no allotment shall be made for more than one-fourth of the cost of the road, nor shall allotment be made for more than 10 mi. in any county in any one year. No allotment shall be made for construction of hard surface roads in towns or cities of more than 10,000 population, but should counties construct brick or concrete roads outside such cities, the highway department may, if this is a portion of the designated state highway system, assume the expense of maintenance. In the case of macadam or material of equal durability, it may assume the supervision of maintenance and such part of the expense as feasible. Any county receiving state reward and failing to maintain road to specified standard can not receive further reward until such maintenance work is done."

Among other duties which the highway department may undertake are the construction of demonstration roads in cooperation with counties or road districts, and the maintaining of a laboratory for testing road materials or the use of such laboratories in state institutions.

There are also sections providing that state prisoners may be worked on public roads under agreement between the Prison Commission and the governor, and providing that funds appropriated by the federal government shall be expended under the supervision of the state highway department.

Funds for carrying out the provisions of the act are to be secured from registration fees on motor vehicles. The fees are set at $2 for each motorcycle and 25 cts. per horsepower for each other motor vehicle with a minimum of $7.50 and a maximum of $15. The funds derived from this source are to be deposited in a state highway fund, one-third of which must be returned twice each year to the county from which it came, to be used for road work under plans approved by the department.

Conference on Highway Construction and Maintenance

The University of Pittsburgh in cooperation with the Pennsylvania State Highway Department will hold a conference on highway construction and maintenance in Thaw Hall, University of Pittsburgh, Pittsburgh, Pa., January 29 to February 3, inclusive.

This course in highway engineering will be a continuation of the short course which was given last year by the university, the subjects for discussion being the same, but the conferences will be so arranged that those who are present this year for the first time may take up the work with those who were in attendance last year. The discussions will be led by officials of the Pennsylvania State Highway Department and members of the faculty of the School of Engineering, University of Pittsburgh. State, county and borough officials, contractors and others interested are cordially invited to attend, and will be given every opportunity to present and discuss problems arising in their work. It is suggested that township road supervisors take advantage of the conferences on account of the part which the townships will play in road building and maintenance during the coming year.

A special point will be made of laboratory work in the testing of materials for highway construction. The new laboratory building now in process of erection will be completed in time for use during the conference. Those desiring tests of materials should send samples to Prof. L. C. McCandliss not later than January 15. No charge will be made for such tests to those attending the conference; to others the fee will be nominal.

A registration fee of $5 payable at the beginning of the course will be charged those attending. Special information will be furnished on request by the Secretary of the Highway Committee, John W. Hallock, Director of Cooperative Work, University of Pittsburgh, Pittsburgh, Pa.

New Bridge Specifications of the Illinois State Highway Department

The Illinois State Highway Department has recently issued to bridge contractors copies of its "General Specifications for Bridge Work," edition of October, 1916.

With the copy of the specifications is inclosed a letter from Clifford Older, Bridge Engineer of the department, stating that the specifications will be used on all bridge work contracted for after January 1, 1917, except such work as was advertised previous to December 1, of this year.

The specifications follow the lines of previous editions, containing complete specifications for loadings, allowable stresses, foundations, concrete work, reinforcing steel and expansion devices, steel work, painting, creosoted timber floors, piling, stone masonry, and other parts of the work. They are printed in a booklet, 8¼ x 10½ ins. in size, consisting of 32 pages and cover.

Large Shipment of Pennsylvania Automobile Plates

The Automobile Division of the Pennsylvania State Highway Department recently gave to the Harrisburg Post Office a shipment of mail matter weighing approximately 40 tons, according to information received from the department. The shipment consisted of 35,000 sets of automobile plates, each set weighing 2 lb., and from 6,000 to 8,000 single plates for motorcycles, etc. Federal employes were sent to the offices of the Automobile Division at Harrisburg to assemble the tags and otherwise prepare them for shipment after they had been wrapped and addressed. Another unusual shipment consisted of 42,000 postcards 3x5 in. in size. For the first time the department this year is using this card for registration, which effects a saving of one cent on each registration.

The number of applications for 1917 licenses received by the department up to a week ago far exceeded those received last year. To take care of this demand the Automobile Division provided an extra force, working practically continuously, and succeeded in sending out the plates on the day the applications were received. The expeditious manner in which the work was handled this year is due in a great measure to the efficient management of George M. Brustarr, Registrar of the division.

Short Road Building Course at the Maryland State College of Agriculture

A four-day course in road building and maintenance has been announced by the Division of Engineering of the Maryland State College of Agriculture for Jan. 17 to 20, at College Park, Md. The instruction is to be given without charge to road builders and others interested. The program is as follows:

Wednesday, Jan. 17, 9 a. m.—Registration.

10 a. m.—"Scope of Course and Necessity for Co-operation Among Road Builders," T. H. Taliaferro, Maryland State College.

11 a. m.—"Earth and Gravel Roads; Construction and Maintenance," R. W. Owens, Resident Engineer, Maryland State Roads Commission.

1.30 p. m. to 3 p. m.—"Bridges and Culverts," O. L. Grover, Bridge Engineer, U. S. Office of Public Roads and Rural Engineering.

3 p. m. to 4.30 p. m.—"The Proper Use and the Abuse of Road Machinery," W. E. Voorhees, The Good Roads Machinery Co.

Thursday, Jan. 18, 9.45 a. m. to 11.15 a. m.—"The Necessity for the Improvement of Roads Other Than the Hard-Surfaced Main Roads," F. E. Schnepfe, Roads Engineer, Queen Anne County, Md.

11.15 a. m. to 12.45 p. m.—"County Road Management," A. R. Losh, Engineer Economist, U. S. Office of Public Roads and Rural Engineering.

1.30 p. m. to 3 p. m.—"Macadam Roads, with Special Emphasis on Maintenance," E. W. James, General Inspector, U. S. Office of Public Roads and Rural Engineering.

3 p. m. to 4.30 p. m.—"Concrete Roads," H. G. Shirley, Chief Engineer, Maryland State Roads Commission.

Friday, Jan. 19, 9.45 a. m. to 11.15 a. m.—"Principles of Cost Keeping," J. J. Tobin, Engineer Economist, U. S. Office of Public Roads and Rural Engineering.

11.15 a. m. to 12.45 p. m.—"Effect of Traffic on Roads, With Particular Reference to City and Suburban Streets," R. Keith Compton, Chairman and Consulting Engineer, Baltimore Paving Commission.

1.30 p. m. to 3 p. m.—"Construction of Roads Other Than Concrete for Heavy Traffic," H. K. Bishop, District Engineer, U. S. Office of Public Roads and Rural Engineering.

3 p. m. to 4.30 p. m.—Round table discussion of subjects pertaining to roads in which those attending course may be interested.

On Saturday morning at 10 o'clock an opportunity will be given to visit the road laboratory of the U. S. Office of Public Roads and Rural Engineering, in the Willard building, Washington, D. C., under the direction of Prevost N. Hubbard, Chief of Tests and Research.

Paving Program for Cleveland, Ohio

Nearly fifty miles of streets are included in the 1917 paving program for the city of Cleveland, Ohio, which has recently been completed by Alex Bernstein, Public Service Director, according to a recent report.

The Council already has passed ordinances authorizing the repaving of portions of the following streets: Clark, Cedar, Euclid, Denison and Lakeside Aves., E. 9th, E. 65th, E. 69th, E. 77th, E. 24th, E. 40th, and E. 89th Sts., Mayfield Road and Broadway.

Amador County, California, Wants Improved Lateral

The citizens of Amador County, California, are endeavoring to secure a bond issue for the construction of the highway leading from Jackson to Plymouth.

This road is included in what is known as the River-to-River Road project to form a connecting lateral from the Mokelumne River on the south to the Consumnes on the north. The exact route has not been established by the State Highway Commission, but it will probably take in the towns of Martels, Ione, Connolly and Clay Station.

The Bodies of Two Motor Trucks Used to Haul Hot Asphaltic Mixtures in Chicago, Ill., have been equipped with an insulating lining, according to a recent report. The vehicles are 7-ton trucks operated by the White Paving Co. Asbestos is used as the insulating material and is held between planks and steel plates. The whole lining can be removed when it is desired to use a truck for other purposes.

A 500-Mile Concrete Road Crossing Kansas from east to west has been recommended by a committee of the National Old Trails Road Association, according to advices from the Portland Cement Association. The committee was appointed at the fifth annual convention of the National Old Trails Road Association, held at Herington, Kan., to recommend the type of construction for a cross-state highway.

The Study of Maintenance of Concrete Pavements has been undertaken on an extensive scale by the Portland Cement Association, which reports the satisfactory progress of the work. Late in November, 1916, it was reported that nearly 20,000,000 of the 70,000,000 sq. yds. of such pavements had been examined and reported upon and it was expected that the work would be completed during December.

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Meeting of the American Association for the Advancement of Science

Two sessions of the convention of the American Association for the Advancement of Science at New York this week were devoted to the subject of highways.

On the afternoon of Thursday, December 28, there was a joint session of Section D, Engineering; the Society for the Promotion of Engineering Education; the Automobile Club of America; the National Highways Association, and the National Automobile Chamber of Commerce. The subject considered was highway engineering education. Papers were scheduled for presentation as follows:

"The Value of a Training in the Humanities for Engineers," Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York, N. Y.; "What Is Best in Engineering Education," H. H. Higbie, Professor of Electrical Engineering, University of Michigan; "Essential Qualifications of Highway Engineers for State, County and Municipal Departments," E. A. Stevens, Commissioner of Public Roads of New Jersey; "The Objects of the Educational Campaign of the National Automobile Chamber of Commerce," Alfred Reeves, General Manager, National Automobile Chamber of Commerce, New York, N. Y.; "Highway Engineering Electives in the Fourth Year of Civil Engineering Courses," Hector J. Hughes, Professor of Civil Engineering, Massachusetts Institute of Technology; "The Need for Highway Engineering Courses in Civil Engineering Curricula of Western Universities," T. R. Agg, Professor of Highway Engineering, Iowa State College; "Limitations of Field and Laboratory Work in Highway Engineering in Civil Engineering Curricula," C. S. Farnham, Assistant Professor of Civil Engineering, Yale University; "Subjects Recommended for Inclusion in Civil Engineering Courses to Qualify Graduates to Enter the Field of Highway Engineering," Arthur H. Blanchard, Professor of Highway Engineering, Columbia University.

On the evening of the same day there was a joint session of Section D, the Automobile Club of America, the National Highways Association, the Motor Truck Club of America, the National Automobile Chamber of Commerce, and the Citizens' Street Traffic Committee of Greater New York on the subject of highway engineering. Papers scheduled for presentation at this session were as follows:

"The Interrelations of Seaport, Railroad and Highway Terminals," Calvin Tomkins, New York City; "Rotary Traffic—Accomplishments and Possibilities," William P. Eno, Chairman, Citizen's Street Traffic Committee of Greater New York; "Recent Investigations of Tractive Resistances to Motor Trucks on Roads and Pavements," A. E. Kennelly, Professor of Electrical Engineering and Director of the Research Division of the Department of Electrical Engineering, and O. R. Schurig, Instructor in Electrical Engineering, Massachusetts Institute of Technology; "Speed Governors for Motor Trucks," Theodore Douglas, President, Duplex Engine Governor Company, Inc., Brooklyn, N. Y.; "Factors Controlling Maximum Over-all Dimensions of Motor Trucks," Alfred F. Masury, Chief Engineer, International Motor Company, New York, N. Y.; "Traffic Census Analysis," William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa.; "The Most Satisfactory and Economical Pavement for Parkway Drives," Samuel Whinery, Civil Engineer, New York, N. Y.; "Present Status of Preliminary Location and Mapping of National Highways Proposed by the National Highways Association," Charles Henry Davis, President, National Highways Association; "Possible Variations of Physical Properties of Rock from One Quarry," Charles P. Berkey, Associate Professor of Geology, Columbia University; "Stone and Concrete Foundations from the Standpoint of Efficiency and Economy," George C. Warren, President, Warren Brothers Company, Boston, Mass.; "Present Status of Bituminous Surfaces on Gravel Roads," John R. Rablin, Chief Engineer, Metropolitan Park Commission, Boston, Mass.; "Value of Physical Tests on Bituminous Aggregates," Prevost Hubbard, Chemical Engineer, U. S. Office of Public Roads and Rural Engineering, Washington, D. C.; "Proportions of Ingredients of Bituminous Mortars Used for Fillers," Philip P. Sharples, Manager, General Tarvia Department, The Barrett Company, New York, N. Y.; "Present Status of Physical Tests for Granite Blocks," C. D. Pollock, Consulting Engineer, New York, N. Y.; "Joint Fillers for Granite Block Pavements," Herman H. Schmidt, Chief Engineer, Bureau of Highways, Borough of Brooklyn, New York, N. Y.; "The Real Sources of Trouble in Brick Pavements," Maurice B. Greenough, Consulting Engineer, National Paving Brick Manufacturers' Association, Cleveland, Ohio; "Recent Developments in Details of Construction of Brick Pavements on Green Concrete Foundations and Sand-Cement Superfoundations," William C. Perkins, Chief Engineer, Dunn Wire-Cut Lug Brick Company, Conneaut, Ohio; "The Causes of Cracks in Cement Concrete Pavements," A. T. Goldbeck, Engineer of Tests, U. S. Office of Public Roads and Rural Engineering; "A Condition Survey of Concrete Roads in the United States," A. N. Johnson, Consulting Engineer, Portland Cement Association; "The Necessity for Adequate Methods of Waterproofing in Road Construction," C. J. Morrison, Chief Engineer, Meyer, Morrison and Company, Inc., New York City; "Columbia River Highway" (illustrated by motion pictures), George C. Warren, President, Warren Brothers Company, Boston, Mass.

At the afternoon session all but one of the papers were read. Many of those scheduled for the evening were read only by title.

COMING MEETINGS

January 16-18, 1917—Virginia Road Builders' Association—Sixth annual meeting, Norfolk, Va. Secretary, C. B. Scott, Richmond, Va.

January 17-20, 1917—County Road Engineers Association of Kentucky—Meeting, Bowling Green, Ky. Secretary, F. L. Duffy, Frankfort, Ky.

January 20, 1917—Western Paving Brick Manufacturers' Association—Meeting, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Building, Kansas City, Mo.

February 5-9, 1917—American Road Builders' Association—Fourteenth Annual Convention; Seventh American Good Roads Congress under the auspices of the A. R. B. A., and Eighth National Good Roads Show of Machinery and Materials. Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York, N. Y.

February 7-15, 1917—Tenth Chicago Cement Show—Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle street, Chicago, Ill.

February 8-10, 1917—American Concrete Institute—Annual meeting, Hotel LaSalle, Chicago, Ill. Secretary, Harold D. Hynes, 1418 Walnut Street, Philadelphia, Pa.

February 19-24, 1917—Southwestern Concrete Association—Annual meeting and show, Kansas City, Mo. Chairman of committee, Charles A. Stevenson, 1433 West 10th St., Kansas City, Mo.

Virginia Road Builders' Association

As previously announced in "Good Roads" the sixth annual convention of the Virginia Road Builders' Association will be held at the Monticello Hotel, Norfolk, Va., Jan. 16, 17 and 18. The chief topics for discussion at this meeting will be problems of road building in Virginia, with especial reference to maintenance.

G. P. Coleman, State Highway Commissioner of Virginia, will explain the federal aid road act and the rules and regulations under which it is to be administered.

Senator C. O'Connor Goolrick, Chairman of the committee appointed by the general assembly to recommend a system of state highways for Virginia, has called a meeting of the committee for the same time and place, at which all who are concerned in the location of such roads are requested to present their views.

The program includes a tour of inspection of the concrete roads on which Norfolk County is spending $200,000. Other trips and entertainments, including a visit to the Norfolk Navy Yard, are being arranged.

MEETINGS

Oklahoma Society of Engineers

A meeting of the Oklahoma Society of Engineers was held at Tulsa, Okla., on Dec. 27 and 28. Among the papers of interest to road builders which were scheduled for presentation were the following:

"The Postcard as a Highway Stimulant," by F. E. Harkness, Oklahoma City; "Responsibility of the Highway Consulting Engineer," by H. V. Hinckley, Oklahoma City; "Build the Maintenance into the Highway," by R. E. Brownell, Oklahoma City; "Subsurface Structures and Street Paving," by W. F. Donathan, Pawnee; "Highway Financeering," by W. S. Hawkins, Durant; and "Needs of the Highway Department," by Max L. Cunningham, State Engineer, Oklahoma City.

For the evening of Thursday, Dec. 28, there was scheduled a question box and smoker. Among the questions listed for consideration were the following:

1. Should paved roads be always built above maximum high water? 2. Should Oklahoma adopt the Kansas statute which requires bridges to be of reinforced concrete when the increased cost over steel or stone does not exceed 30 per cent.? 3. What are the minimum, maximum and average salaries paid to state engineers in other states? 4. Should Oklahoma pay its state engineer as much as the average salary paid by other states? 5. Should concrete roads or concrete foundation for roads have longitudinal extension joints? 6. Should they have longitudinal reinforcement? 7. Should they have transverse armored joints? 8. Should they have transverse reinforcement? 9. Will longitudinal reinforcement justify longer sections? 10. What is the maximum length of a concrete slab? 11. What is the maximum length of a reinforced concrete slab? 12. What is there to the "vertical fiber" idea in brick pavement? 13. Does a wire cut put a fibrous texture into a brick? 14. What is the main advantage in a sand cushion under brick? 15. What is the main disadvantage in a sand cushion under brick? 16. What will prevent cracking of a paved road on a new bank? 17. What top dressing on a graveled road makes strongest binder? 18. Is two-course work to be recommended in concrete paving? 19. Is a 1:2:3 wearing surface better than 1:2:4? 20. Does a bituminous covering on a concrete pavement improve it?

Illinois Improvement Association

The fifth annual convention of the Illinois Improvement Association was held at Danville, Ill., Dec. 19, in conjunction with the dedication of the Vermilion County branch of the Dixie Highway. A resolution recommending to the next legislature that a $60,000,000 bond issue for the improvement of Illinois roads be submitted to a referendum vote at the November, 1918, election was adopted. An increase in the license fee for heavy automobiles and trucks was also recommended.

Officers were elected as follows: President, W. G. Edens, Chicago; Vice Presidents, Richard Finnegan, Chicago; Charles Kiler, Urbana; John Logan, Elgin; Arthur Hall, Danville; W. E. Crossley, Cairo; Treasurer, Thomas Suddeth, Springfield; Secretary, Robert Dunn, Chicago.

PERSONAL NOTES

Gordon Sumner has been made Highway Engineer of Bay County, Florida.

Roscoe Sawistowsky has been elected City Engineer of Davenport, Ia.

C. C. Huffine has received the appointment of City Engineer of Frankfort, Ind.

W. S. Curtis has been appointed Assistant State Engineer of California.

James H. Riddle, formerly connected with the West Virginia University, has joined the field staff of the Portland Cement Association at Parkersburg, W. Va.

J. T. Bullen, who has had charge of road construction in Raleigh County, West Virginia, has resigned to assume charge of a district under the federal aid act.

W. L. Clark has been appointed Division Engineer of the California Highway Commission with headquarters at San Francisco. Mr. Clark was Assistant Highway Engineer of the state.

John Swan, Jr., a brother of the late Robert Swan, has been appointed Director of the Department of Public Works, Pittsburgh, Pa., to fill the vacancy caused by the death of Edward M. Bigelow.

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